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ABSTRACT

This vocational program guide is intended to assist in the organization, operation, and evaluation of a program in environmental horticulture in school districts, area vocational centers, and community colleges. The following topics are covered: program content and structure (job titles and curriculum framework and student performance standards); facilities (design criteria, shop and laboratory, suggested equipment and supplies, classroom, and safety); program implementation (agriculture enhancement teaching-learning plans, student learning guide, and student organization participation); professional considerations (teacher certification and professional organizations and support services); and instructional resources (sources of print and audiovisual materials and software and teacher-recommended materials). Sample teaching-learning plans, a sample student learning guide, and sample related math exercises for environmental horticulture are appended. A Career Merit Achievement Plan (Career MAP) for use in recording the progress of students enrolled in a environmental horticulture program is packaged with the program guide. Included in the Career MAP are a list of relevant job titles, overview of the MAP and directions for using it, guidelines for rating student performance standards, and charts detailing the various subcompetencies of the environmental horticulture skills and work environment readiness skills covered in the environmental horticulture program. (MN)

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FLORIDA VOCATIONAL PROGRAM GUIDE FOR

ENVIRONMENTAL HORTICULTURE

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FLORIDA VOCATIONAL
PROGRAM GUIDE FOR

**ENVIRONMENTAL
HORTICULTURE**

State of Florida
Department of Education
Tallahassee, Florida
Betty Castor, Commissioner
Affirmative action/equal opportunity employer

Division of Vocational, Adult, and Community Education
Bureau of Vocational Program and Staff Development

July 1991

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INTRODUCTION

The *Florida Vocational Program Guide for Environmental Horticulture* has been developed to provide information that will be useful to local administrators, regional coordinating councils, teachers, and others charged with the responsibility of offering vocational education in Environmental Horticulture in school districts, area vocational-technical centers, and community colleges. The final planning, implementation, and evaluation of any educational program, however, must be done within the context of local conditions and local needs.

Many of the elements involved in the creation and maintenance of a vocational education program are generic to all subject areas; these issues are addressed in detail in the *Florida Vocational Program Implementation Guide* (FVPIG), **which should be considered an essential companion piece to this document.** The FVPIG contains information on the following:

- the importance of, as well as development strategies for, student learning guides
- information addressing concerns about program planning and implementation
- teacher requirements, updating, and certification
- program-evaluation requirements
- in-depth program-component description

The *Florida Vocational Program Guide for Environmental Horticulture* will serve to identify particular considerations in the organization, operation, and evaluation of this specific vocational education program.

This program guide helps ensure program equivalency. Environmental Horticulture programs, if implemented throughout Florida according to the criteria described in this document, will help many citizens fill important roles in our state and national work force.

PROGRAM CONTENT AND STRUCTURE

The content of the Environmental Horticulture program is based on occupational competencies and employability skills required for entry into horticultural businesses and industries. The basic content of this program is described in the Florida Curriculum Framework and Student Performance Standards (SPSs). The Student Performance Standards were validated during a pilot program for the enhancement of vocational agriculture education by nine pilot sites during the 1989-90 and 1990-91 school years. This validation effort was sponsored by the Division of Vocational, Adult, and Community Education (DVACE).

The Environmental Horticulture program includes both classroom and practical learning experiences that provide students with career information and job requirements for occupations in environmental horticulture businesses and industries. This program provides students with an initial exposure to the skills and attitudes associated with careers in related agricultural occupations. The basic skills and attitudes related to these occupations are indicated as intended outcomes in the Curriculum Framework of this guide.

Job Titles

The purpose of the Environmental Horticulture program is to prepare students for employment as a nursery worker; horticultural specialty grower, field; horticultural specialty grower, inside; horticulture pest-control worker; disease- and insect-control field inspector; landscape laborer; or landscape gardener. Descriptions for these job titles can be found in the *Dictionary of Occupational Titles*.

Curriculum Framework and Student Performance Standards

Program objectives and content should be consistent with the Vocational Education Program Courses Standards as approved by the Florida State Board of Education. Provided on the following pages are the Curriculum Framework and SPSs for Environmental Horticulture courses as listed in the official *Vocational Education Program Courses Standards* document. Since these SPSs are continually updated, you should check every year with your district's agribusiness and natural resources education supervisor and the regional program specialist for a current version.

CURRICULUM FRAMEWORK

PROGRAM AREA: Agriculture

FLORIDA DEPARTMENT OF
EDUCATION

EFFECTIVE DATE: July 1991

PROGRAM TITLE: Environmental Horticulture

CODE NUMBER: Secondary 8121500

Postsecondary ORV0010

Florida CIP 0101.069901

SECONDARY

SCHOOL CREDITS 3 COLLEGE CREDITS

POSTSECONDARY ADULT

VOCATIONAL CREDITS X

APPLICABLE LEVEL(S): 7-9 9-12 X Postsecondary Adult Vocational

 Postsecondary Vocational

X Other 10-12, 30, 31

CERTIFICATION
COVERAGE:

10-12, 30, 31 VOC AGRI @4
HORTICULT #7

AGRI @4
AGRICULTUR 1 2

30, 31 VOC AGRI @4
HORTICULT @7 G

AGRI @2 @4
AGRICULTUR 1 2

- I. **Major Concepts/Content.** The purpose of this program is to prepare students for employment in positions in the agriculture industry, such as nursery worker (79005503), horticultural specialty grower, field (405.161-014); horticultural specialty grower, inside (405.161-018); horticultural pest-control worker (408.381-010); disease- and insect-control field inspector (408.687-010); landscape laborer (408.687-014); and landscape gardener (408.161-010); or to provide supplemental training for persons previously or currently employed in these occupations.

This program is one of the three Florida standard cores of agriculture competencies. Completers of this program will be prepared to enter advanced training and education in specialized fields of agriscience or agribusiness. They

may also be employed as trainees or beginning workers in various agriscience- or agribusiness-related positions in certain businesses and industries.

The content includes, but is not limited to, instruction that prepares individuals to produce, process, market, and maintain plants, shrubs, turf, and trees used principally for functional, recreational, and aesthetic purposes. State-of-the-art technology coupled with environmentally sound principles and practices will be employed to carry out this instruction. Subject matter also includes fertilization, irrigation, harvesting and marketing, facility maintenance, safe operation and maintenance of related equipment, pest management, and plant identification, as well as employability skills, mathematics, biological science, communications, and human-relations skills.

Listed below are the courses that this program comprises when offered at the secondary level:

8106810 Agriscience Foundations
8121510 Introductory Horticulture
8121520 Horticultural Science

- II. **Laboratory Activities.** Classroom, plant nursery laboratory, and shop, as well as the general maintenance and safe use of all instructional resources, are integral parts of this program.
- III. **Special Note.** FFA (secondary) and the National Postsecondary Agriculture Student Organization (postsecondary) are the appropriate vocational student organizations for providing leadership-training experiences and for reinforcing specific vocational skills. These activities are considered an integral part of this instructional program.

Planned and supervised occupational activities must be provided through one or more of the following: (1) directed laboratory experience, (2) student project, (3) placement for experience, and (4) cooperative education.

Because of the production and marketing cycle of ornamental-horticulture industries, this program requires individual instruction and supervision of students for the entire period beyond the 180-day school year.

The cooperative method of instruction is appropriate for this program. Students can take the cooperative training either during the program or after completing it. Whenever the cooperative method is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; and a workstation reflecting the equipment, skills, and tasks that are relevant to the occupation that the student has chosen as a career goal. The student must receive compensation for work performed.

In accordance with Section 233.0695, F.S., the minimum basic-skills grade levels required for this postsecondary adult vocational program are 8.0 for Mathematics and 8.0 for Language. These grade-level numbers correspond to grade-equivalent scores obtained on a state-designated basic-skills examination.

The typical length of this program for the average-achieving student is 450 hours.

The particular outcomes and SPSs that the handicapped student must master to earn credit must be specified in the student's individual education plan (IEP). Additional credits may be earned when outcomes and standards are mastered in accordance with the requirements indicated in subsequent IEPs. The job title for which the student is being trained must be designated in the IEP.

This program may be offered in courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 230.643, F.S.

IV. **Intended Outcomes.** After successfully completing this program, the student will be able to:

01. Describe the socioeconomic role of agriculture.
02. Apply important scientific and technological principles to agribusiness and natural resources.
03. Practice agricultural safety.
04. Demonstrate the use of tools and equipment, and describe the principles of agricultural mechanics.
05. Describe the principles of pest management for insects, diseases, and weeds.
06. Describe the principles of plant growth and reproduction.
07. Apply management skills and economic principles to agribusiness and natural resources.
08. Explain the basic functions of the marketing process in agriculture.
09. Demonstrate human-relations, communications, and leadership skills.
10. Describe the horticulture industry.
11. Identify and classify plants.
12. Propagate plants.
13. Identify growing media and apply fertilizers.
14. Irrigate plants and turf.
15. Control pests.
16. Control plant growth.
17. Harvest, transport, and install plant materials.
18. Operate, repair, and maintain tools and equipment.
19. Demonstrate leadership, employability, communications, and human-relations skills.

STUDENT PERFORMANCE STANDARDS

EFFECTIVE DATE: July 1991

PROGRAM AREA: Agriculture

SECONDARY NUMBER: 8121500

PROGRAM TITLE: Environmental
Horticulture

POSTSECONDARY
NUMBER: ORV0010

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF AGRICULTURE--The student will be able to:

- 01.01 Prepare an overview of the history of agriculture.
- 01.02 Discuss agricultural products and services important to the local, state, national, and global economy.
- 01.03 Investigate career opportunities in agriscience, and identify which school activities would help one prepare for those careers.
- 01.04 Discuss agriculture's role in the interaction of population, food, and energy.

02.0 APPLY IMPORTANT SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO AGRIBUSINESS AND NATURAL RESOURCES--The student will be able to:

- 02.01 Discuss the importance of scientific classification in agriculture.
- 02.02 Use scientific methods to solve problems in agriculture.
- 02.03 Demonstrate the use of genetics, including probability applications, through an agricultural project/activity.
- 02.04 Analyze how recent technology is impacting agriscience.
- 02.05 Identify the components of an agricultural ecosystem, and recognize the role of each.
- 02.06 Construct and analyze a diagram of a biological food chain common to Florida agriculture and natural resources.
- 02.07 Describe how water, carbon, nitrogen, oxygen, sulfur, and phosphorus are recycled naturally.
- 02.08 Evaluate soil profiles, land-capability classes, and soil-conservation practices.
- 02.09 List the components of Florida's freshwater systems (lakes, groundwater, aquifers, sinkholes, rivers, and swamps), and explain the importance of managing these resources.
- 02.10 Explain how increasing or decreasing the use of one natural resource may affect another resource.
- 02.11 Describe the causes and effects of air, water, and land pollution, and identify ways to prevent pollution.
- 02.12 Explain the flow of energy from the sun, through agricultural systems (i.e., the common food pyramid), and back into the abiotic environment.
- 02.13 Recognize the environmental requirements necessary for a productive natural or man-made aquaculture system.
- 02.14 Apply principles of sound waste management to environmental problems common to agricultural systems.

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

- 03.01 List the most common causes of agricultural accidents.
- 03.02 Discuss the importance of following proper safety precautions.
- 03.03 Demonstrate safety procedures in the classroom and laboratory.
- 03.04 Describe the importance of following the directions on chemical containers and in equipment operator manuals.
- 03.05 Recognize the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).
- 03.06 Demonstrate safe and effective use of laboratory equipment, instruments, and materials.

04.0 DEMONSTRATE THE USE OF TOOLS AND EQUIPMENT, AND DESCRIBE THE PRINCIPLES OF AGRICULTURAL MECHANICS--The student will be able to:

- 04.01 Describe the importance of using the proper tools and equipment for the job.
- 04.02 Describe the principles of selected mechanical applications (e.g., levers, pulleys, hydraulics, internal combustion).
- 04.03 Demonstrate the ability to use an equipment manual.
- 04.04 Demonstrate the use of selected tools and equipment.
- 04.05 Service, maintain, and store tools, equipment, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT FOR INSECTS, DISEASES, AND WEEDS--The student will be able to:

- 05.01 Identify major types of pests and weed infestations.
- 05.02 Identify and select an appropriate control for each major type of pest, including the use of Integrated Pest Management.
- 05.03 Describe symptoms of pesticide poisoning.
- 05.04 Extract pertinent information from a pesticide label.
- 05.05 Select, mix, and apply a nonrestricted chemical, according to the label and local, state, federal, and Environmental Protection Agency (EPA) regulations.
- 05.06 Clean and store pesticide-application equipment, safety clothing, and safety equipment.
- 05.07 Identify the proper disposal of containers and residual pesticides.
- 05.08 Calibrate spray equipment; solve time, distance, area, volume, ratio, proportion, and percentage problems in agriscience.

06.0 DESCRIBE THE PRINCIPLES OF PLANT GROWTH AND REPRODUCTION--The student will be able to:

- 06.01 Identify the raw materials and products of photosynthesis and respiration, the plant structures involved, and the environmental conditions necessary for each reaction.
- 06.02 Describe the functions of roots, stems, leaves, and flowers.

- 06.03 Demonstrate sexual and asexual plant propagation.
- 06.04 Demonstrate the effects of nitrogen, phosphorus, and potassium (N.P.K.) on plant growth.
- 06.05 Extract pertinent information from a fertilizer label.
- 06.06 Describe the short- and long-range impact of fertilizer on people and the environment.

07.0 APPLY MANAGEMENT SKILLS AND ECONOMIC PRINCIPLES TO AGRIBUSINESS AND NATURAL RESOURCES--The student will be able to:

- 07.01 Identify basic economic principles applicable to agribusiness.
- 07.02 Explain the importance of local, state, and federal regulations and required documentation affecting agriculture.
- 07.03 Describe the types of agribusiness by organizational structure.
- 07.04 Select and use computer applications appropriate to agribusiness.
- 07.05 Form one or more inferences or hypotheses from records summarized in tables, graphs, or pictures.
- 07.06 Keep and maintain supervised agricultural experience (SAE) records.
- 07.07 Interpret legal descriptions of land in Florida.

08.0 EXPLAIN THE BASIC FUNCTIONS OF THE MARKETING PROCESS IN AGRICULTURE--The student will be able to:

- 08.01 Describe key factors in marketing agricultural products.
- 08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

- 09.01 Demonstrate acceptable work habits and attitudes.
- 09.02 Follow oral and written directions with understanding; form questions that clarify directions, as needed.
- 09.03 Communicate effectively in oral, written, visual, and nonverbal modes; demonstrate effective telephone skills.
- 09.04 Recognize and demonstrate reflective listening skills and assertive communications skills in the workplace.
- 09.05 Conduct small, informal, and group meetings.
- 09.06 Demonstrate a knowledge of the opportunities for leadership development available through an appropriate student organization.

10.0 DESCRIBE THE HORTICULTURE INDUSTRY--The student will be able to:

- 10.01 Describe the importance of horticulture to the American and global economies.
- 10.02 Identify career opportunities in horticulture and educational requirements and continuing education opportunities for horticulture careers.
- 10.03 Describe the importance of horticulture to the environment.
- 10.04 Describe regulations that affect the horticulture industry.

10.05 Identify professional organizations and trade journals in the horticulture industry.

11.0 IDENTIFY AND CLASSIFY PLANTS--The student will be able to:

- 11.01 Identify plants by scientific and common names. Levels I and II.
- 11.02 Classify plants botanically and list environmental preferences of plants (e.g., shade, sun, wind, moisture, salt). Levels I and II.

12.0 PROPAGATE PLANTS--The student will be able to:

- 12.01 Identify propagating and growing facilities and structures.
- 12.02 Prepare propagation media.
- 12.03 Select and collect propagation materials.
- 12.04 Demonstrate propagation by sexual and asexual methods.
- 12.05 Demonstrate environmental controls for propagation materials (e.g., moisture, temperature, light).
- 12.06 Transplant rooted propagation materials.

13.0 IDENTIFY GROWING MEDIA AND APPLY FERTILIZERS--The student will be able to:

- 13.01 Identify soil and media materials.
- 13.02 Identify nutritional needs of plants.
- 13.03 Collect soil samples for laboratory analysis and interpret the results.
- 13.04 Identify symptoms of nutritional deficiencies and toxicities of plants.
- 13.05 Identify types and kinds of fertilizers.
- 13.06 Identify methods of distributing fertilizers.
- 13.07 Interpret an analysis of fertilizer from information on tag or container.
- 13.08 Develop a fertilization schedule.
- 13.09 Determine rate of fertilizer application.
- 13.10 Apply fertilizer and soil amendments.
- 13.11 Apply special fertilization methods appropriate to a region or plant group.
- 13.12 Maintain fertilization records.

14.0 IRRIGATE PLANTS AND TURF--The student will be able to:

- 14.01 Identify water needs of plants.
- 14.02 Identify sources and quality of water for irrigation.
- 14.03 Identify irrigation components and types of systems.
- 14.04 Install irrigation-system components.
- 14.05 Irrigate plants at recommended rates.
- 14.06 Identify procedures for measuring water-application rates.
- 14.07 Repair irrigation systems.
- 14.08 Identify drainage components for different types of drainage systems.

15.0 CONTROL PESTS--The student will be able to:

- 15.01 Identify common pests of plants (e.g., diseases, weeds, nematodes).
- 15.02 Describe life cycles of common pests of plants.
- 15.03 Classify insects according to feeding habits.
- 15.04 Describe biological, chemical, and cultural methods of controlling plant pests.
- 15.05 Select and identify pesticides according to controlling action (e.g., stomach, contact, systemic).
- 15.06 Interpret information on a pesticide or agricultural chemical label.
- 15.07 Describe symptoms of pesticide poisoning and identify required first aid.
- 15.08 Comply with local, state, federal, and EPA regulations regarding pesticides.
- 15.09 Store, select, mix, and apply pesticides safely according to the product label.
- 15.10 Clean, adjust, and calibrate spray equipment.
- 15.11 Maintain pesticide records.

16.0 CONTROL PLANT GROWTH--The student will be able to:

- 16.01 Identify methods of pruning plants to achieve desired growth and to maintain health.
- 16.02 Identify and select chemical growth regulators.
- 16.03 Identify appropriate time to prune plants.
- 16.04 Identify and select pruning tools for the task.
- 16.05 Prune plants safely and sterilize tools.
- 16.06 Root-prune appropriate plants.

17.0 HARVEST, TRANSPORT, AND INSTALL PLANT MATERIALS--The student will be able to:

- 17.01 Determine requirements for preserving plant viability.
- 17.02 Install containerized plant materials.
- 17.03 Select and prepare plants for transportation and transplanting.
- 17.04 Describe principles of xeriscaping.
- 17.05 Describe principles of integrated landscape management.

18.0 OPERATE, REPAIR, AND MAINTAIN TOOLS AND EQUIPMENT--The student will be able to:

- 18.01 Perform equipment preoperational check.
- 18.02 Identify, maintain, and safely operate hand tools and power tools.
- 18.03 Identify, maintain, and safely operate small gasoline engines.
- 18.04 Identify, maintain, and safely operate power equipment.
- 18.05 Maintain equipment operation and service records.

19.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATIONS, AND HUMAN-RELATIONS SKILLS--The student will be able to:

- 19.01 Conduct group meetings, using parliamentary procedure and public-speaking skills.
- 19.02 Identify acceptable work habits and personal characteristics.
- 19.03 Identify acceptable employee hygiene habits.
- 19.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
- 19.05 Demonstrate knowledge of how to make job changes.
- 19.06 Identify documents that may be required for a job application.
- 19.07 Complete pertinent forms for employment (e.g., resume, job application, W-4).
- 19.08 Demonstrate competence in job-interview techniques.

STUDENT PERFORMANCE STANDARDS

EFFECTIVE DATE: July 1991

PROGRAM AREA: Agriculture

COURSE CREDIT: 1

PROGRAM TITLE: Environmental
Horticulture

PROGRAM
NUMBER: 8121500

COURSE TITLE: Agriscience
Foundations

COURSE NUMBER: 8106810

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural history; global importance of agriculture; career opportunities; applied scientific and technological concepts; ecosystems; agricultural safety; principles of pest management; principles of plant growth; management principles; agricultural marketing; and human-relations skills.

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF AGRICULTURE--The student will be able to:

- 01.01 Prepare an overview of the history of agriculture.
- 01.02 Discuss agricultural products and services important to the local, state, national, and global economy.
- 01.03 Investigate career opportunities in agriscience, and identify which school activities would help one prepare for those careers.
- 01.04 Discuss agriculture's role in the interaction of population, food, and energy.

02.0 APPLY IMPORTANT SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO AGRIBUSINESS AND NATURAL RESOURCES--The student will be able to:

- 02.01 Discuss the importance of scientific classification in agriculture.
- 02.02 Use scientific methods to solve problems in agriculture.
- 02.03 Demonstrate the use of genetics, including probability applications, through an agricultural project/activity.
- 02.04 Analyze how recent technology is impacting agriscience.
- 02.05 Identify the components of an agricultural ecosystem, and recognize the role of each.
- 02.06 Construct and analyze a diagram of a biological food chain common to Florida agriculture and natural resources.
- 02.07 Describe how water, carbon, nitrogen, oxygen, sulfur, and phosphorus are recycled naturally.
- 02.08 Evaluate soil profiles, land-capability classes, and soil-conservation practices.

- 02.09 List the components of Florida's freshwater systems (lakes, groundwater, aquifers, sinkholes, rivers, and swamps), and explain the importance of managing these resources.
- 02.10 Explain how increasing or decreasing the use of one natural resource may affect another resource.
- 02.11 Describe the causes and effects of air, water, and land pollution, and identify ways to prevent pollution.
- 02.12 Explain the flow of energy from the sun, through agricultural systems (i.e., the common food pyramid), and back into the abiotic environment.
- 02.13 Recognize the environmental requirements necessary for a productive natural or man-made aquaculture system.
- 02.14 Apply principles of sound waste management to environmental problems common to agricultural systems.

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

- 03.01 List the most common causes of agricultural accidents.
- 03.02 Discuss the importance of following proper safety precautions.
- 03.03 Demonstrate safety procedures in the classroom and laboratory.
- 03.04 Describe the importance of following the directions on chemical containers and in equipment-operator manuals.
- 03.05 Recognize the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).
- 03.06 Demonstrate safe and effective use of laboratory equipment, instruments, and materials.

04.0 DEMONSTRATE THE USE OF TOOLS AND EQUIPMENT, AND DESCRIBE THE PRINCIPLES OF AGRICULTURAL MECHANICS--The student will be able to:

- 04.01 Describe the importance of using the proper tools and equipment for the job.
- 04.02 Describe the principles of selected mechanical applications (e.g., levers, pulleys, hydraulics, internal combustion).
- 04.03 Demonstrate the ability to use an equipment manual.
- 04.04 Demonstrate the use of selected tools and equipment.
- 04.05 Service, maintain, and store tools, equipment, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT FOR INSECTS, DISEASES, AND WEEDS--The student will be able to:

- 05.01 Identify major types of pests and weed infestations.
- 05.02 Identify and select an appropriate control for each major type of pest, including the use of Integrated Pest Management.
- 05.03 Describe symptoms of pesticide poisoning.
- 05.04 Extract pertinent information from a pesticide label.
- 05.05 Select, mix, and apply a nonrestricted chemical, according to the label and local, state, federal, and Environmental Protection Agency (EPA) regulations.

- 05.06 Clean and store pesticide-application equipment, safety clothing, and safety equipment.
- 05.07 Identify the proper disposal of containers and residual pesticides.
- 05.08 Calibrate spray equipment; solve time, distance, area, volume, ratio, proportion, and percentage problems in agriscience.
- 06.0 DESCRIBE THE PRINCIPLES OF PLANT GROWTH AND REPRODUCTION--The student will be able to:
 - 06.01 Identify the raw materials and products of photosynthesis and respiration, the plant structures involved, and the environmental conditions necessary for each reaction.
 - 06.02 Describe the functions of roots, stems, leaves, and flowers.
 - 06.03 Demonstrate sexual and asexual plant propagation.
 - 06.04 Demonstrate the effects of nitrogen, phosphorus, and potassium (N.P.K.) on plant growth.
 - 06.05 Extract pertinent information from a fertilizer label.
 - 06.06 Describe the short- and long-range impact of fertilizer on people and the environment.
- 07.0 APPLY MANAGEMENT SKILLS AND ECONOMIC PRINCIPLES TO AGRIBUSINESS AND NATURAL RESOURCES--The student will be able to:
 - 07.01 Identify basic economic principles applicable to agribusiness.
 - 07.02 Explain the importance of local, state, and federal regulations and required documentation affecting agriculture.
 - 07.03 Describe the types of agribusiness by organizational structure.
 - 07.04 Select and use computer applications appropriate to agribusiness.
 - 07.05 Form one or more inferences or hypotheses from records summarized in tables, graphs, or pictures.
 - 07.06 Keep and maintain supervised agricultural experience (SAE) records.
 - 07.07 Interpret legal descriptions of land in Florida.
- 08.0 EXPLAIN THE BASIC FUNCTIONS OF THE MARKETING PROCESS IN AGRICULTURE--The student will be able to:
 - 08.01 Describe key factors in marketing agricultural products.
 - 08.02 Select agricultural products according to grades and standards.
- 09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:
 - 09.01 Demonstrate acceptable work habits and attitudes.
 - 09.02 Follow oral and written directions with understanding; form questions that clarify directions, as needed.
 - 09.03 Communicate effectively in oral, written, visual, and nonverbal modes; demonstrate effective telephone skills.

- 09.04 Recognize and demonstrate reflective listening skills and assertive communications skills in the workplace.
- 09.05 Conduct small, informal, and group meetings.
- 09.06 Demonstrate a knowledge of the opportunities for leadership development available through an appropriate student organization.

STUDENT PERFORMANCE STANDARDS

EFFECTIVE DATE: July 1991

PROGRAM AREA: Agriculture

COURSE CREDIT: 1

PROGRAM TITLE: Environmental
Horticulture

PROGRAM
NUMBER: 8121500

COURSE TITLE: Introductory
Horticulture

COURSE NUMBER: 8121510

COURSE DESCRIPTION:

This course is designed to develop competencies in the areas of career opportunities; global importance of agriculture; plant classification; propagation; growing media; nutritional needs; fertilization; irrigation; pest identification; pest control; pruning; plant installation; transplanting; safe hand-tool use; and employability skills.

10.0 DESCRIBE THE HORTICULTURE INDUSTRY--The student will be able to:

- 10.01 Describe the importance of horticulture to the American and global economies.
- 10.02 Identify career opportunities in horticulture and educational requirements and continuing education opportunities for horticulture careers.
- 10.03 Describe the importance of horticulture to the environment.

11.0 IDENTIFY AND CLASSIFY PLANTS--The student will be able to:

- 11.01 Identify plants by scientific and common names. Level I.
- 11.02 Classify plants botanically and list environmental preferences of plants (e.g., shade, sun, wind, moisture, salt). Level I.

12.0 PROPAGATE PLANTS--The student will be able to:

- 12.01 Identify propagating and growing facilities and structures.
- 12.02 Prepare propagation media.
- 12.03 Select and collect propagation materials.
- 12.04 Demonstrate propagation by sexual and asexual methods.
- 12.05 Demonstrate environmental controls for propagation materials (e.g., moisture, temperature, light).

13.0 IDENTIFY GROWING MEDIA AND APPLY FERTILIZERS--The student will be able to:

- 13.01 Identify soil and media materials.
- 13.02 Identify nutritional needs of plants.
- 13.04 Identify symptoms of nutritional deficiencies and toxicities of plants.
- 13.05 Identify types and kinds of fertilizers.

- 13.06 Identify methods of distributing fertilizers.
- 13.07 Interpret an analysis of fertilizer from information on tag or container.
- 13.10 Apply fertilizer and soil amendments.

14.0 IRRIGATE PLANTS AND TURF--The student will be able to:

- 14.01 Identify water needs of plants.
- 14.05 Irrigate plants at recommended rates.

15.0 CONTROL PESTS--The student will be able to:

- 15.01 Identify common pests of plants (e.g., diseases, weeds, nematodes).
- 15.02 Describe life cycles of common pests of plants.
- 15.03 Classify insects according to feeding habits.
- 15.04 Describe biological, chemical, and cultural methods of controlling plant pests.

16.0 CONTROL PLANT GROWTH--The student will be able to:

- 16.01 Identify methods of pruning plants to achieve desired growth and to maintain health.
- 16.03 Identify appropriate time to prune plants.
- 16.04 Identify and select pruning tools for the task.

17.0 HARVEST, TRANSPORT, AND INSTALL PLANT MATERIALS--The student will be able to:

- 17.01 Determine requirements for preserving plant viability.
- 17.02 Install containerized plant materials.
- 17.03 Select and prepare plants for transportation and transplanting.

18.0 OPERATE, REPAIR, AND MAINTAIN TOOLS AND EQUIPMENT--The student will be able to:

- 18.01 Perform equipment preoperational check.
- 18.02 Identify, maintain, and safely operate hand tools and power tools.

19.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATIONS, AND HUMAN-RELATIONS SKILLS--The student will be able to:

- 19.01 Conduct group meetings, using parliamentary procedure and public-speaking skills.
- 19.02 Identify acceptable work habits and personal characteristics.
- 19.03 Identify acceptable employee hygiene habits.
- 19.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.

STUDENT PERFORMANCE STANDARDS

EFFECTIVE DATE: July 1991

PROGRAM AREA: Agriculture

COURSE CREDIT: 1

PROGRAM TITLE: Environmental
Horticulture

PROGRAM
NUMBER: 8121500

COURSE TITLE: Horticulture
Science

COURSE NUMBER: 8121520

COURSE DESCRIPTION:

This course is designed to develop competencies in the areas of industry regulations; plant classification; plant transportation; soil sampling and analysis; fertilizer calculations; irrigation components; water quality; drainage; integrated pest management; pesticide safety and regulations; equipment calibration; chemical growth regulators; xeriscaping; integrated landscape management; safe use of power equipment; record keeping; and employability skills.

10.0 DESCRIBE THE HORTICULTURE INDUSTRY--The student will be able to:

- 10.04 Describe regulations that affect the horticulture industry.
- 10.05 Identify professional organizations and trade journals in the horticulture industry.

11.0 IDENTIFY AND CLASSIFY PLANTS--The student will be able to:

- 11.01 Identify plants by scientific and common names. Level II.
- 11.02 Classify plants botanically and list environmental preference of plants (e.g., shade, sun, wind, moisture, salt). Level II.

12.0 PROPAGATE PLANTS--The student will be able to:

- 12.06 Transplant rooted propagation materials.

13.0 IDENTIFY GROWING MEDIA AND APPLY FERTILIZERS--The student will be able to:

- 13.03 Collect soil samples for laboratory analysis and interpret the results.
- 13.08 Develop a fertilization schedule.
- 13.09 Determine rate of fertilizer application.
- 13.11 Apply special fertilization methods appropriate to a region or plant group.
- 13.12 Maintain fertilization records.

14.0 IRRIGATE PLANTS AND TURF--The student will be able to:

- 14.02 Identify sources and quality of water for irrigation.
- 14.03 Identify irrigation components and types of systems.

- 14.04 Install irrigation-system components.
- 14.06 Identify procedures for measuring water-application rates.
- 14.07 Repair irrigation systems.
- 14.08 Identify drainage components for different types of drainage systems.

15.0 CONTROL PESTS--The student will be able to:

- 15.05 Select and identify pesticides according to controlling action (e.g., stomach, contact, systemic).
- 15.06 Interpret information on a pesticide or agricultural chemical label.
- 15.07 Describe symptoms of pesticide poisoning and identify required first aid.
- 15.08 Comply with local, state, federal, and EPA regulations regarding pesticides.
- 15.09 Store, select, mix, and apply pesticides safely according to the product label.
- 15.10 Clean, adjust, and calibrate spray equipment.
- 15.11 Maintain pesticide records.

16.0 CONTROL PLANT GROWTH--The student will be able to:

- 16.02 Identify and select chemical growth regulators.
- 16.05 Prune plants safely and sterilize tools.
- 16.06 Root-prune appropriate plants.

17.0 HARVEST, TRANSPORT, AND INSTALL PLANT MATERIALS--The student will be able to:

- 17.04 Describe principles of xeriscaping.
- 17.05 Describe principles of integrated landscape management.

18.0 OPERATE, REPAIR, AND MAINTAIN TOOLS AND EQUIPMENT--The student will be able to:

- 18.03 Identify, maintain, and safely operate small gasoline engines.
- 18.04 Identify, maintain, and safely operate power equipment.
- 18.05 Maintain equipment operation and service records.

19.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATIONS, AND HUMAN-RELATIONS SKILLS--The student will be able to:

- 19.05 Demonstrate knowledge of how to make job changes.
- 19.06 Identify documents that may be required for a job application.
- 19.07 Complete pertinent forms for employment (e.g., resume, job application, W-4).
- 19.08 Demonstrate competence in job-interview techniques.

FACILITIES _____

Design Criteria

Listed below are the minimum, normal, and maximum space requirements for Environmental Horticulture instructional programs according to the **Rules of the Florida State Board of Education (Florida Administrative Code), Ch. 6A-2.**

DEDICATED SPACE (in square feet)

	Per Student			Total (Based on 20 students)		
	Min.	Normal	Max.	Min.	Normal	Max.
Ornamental Laboratory	48	50	52	960	1,000	1,040
A-7 Classroom Instruction				500	525	550
F-7 Greenhouse				760	800	840
I-3 Lockers, Toilets, and Showers				140	150	160
M-1 Reference				190	200	210
P-2 Storage, Flammable				165	175	185
P-8 Storage, Material				165	175	185
S-8 Storage, Tool				330	350	370
Q-9 Storage, Machinery				1,000	1,100	1,200
Required Program Space				4,210	4,475	4,740
_____ 23 _____						

Shop and Laboratory

Classroom/laboratory areas should be designed to accommodate Environmental Horticulture workstations and equipment. Land laboratories may also be appropriate.

Suggested Equipment and Supplies

For instruction to meet the needs of future farm operators and workers in agribusiness and industry, adequate equipment, tools, and reference materials must be available. Instructional programs will vary from one school to another. This fact makes it almost impossible to publish a basic list of equipment that will be adequate for all situations. Several factors influence the recommendation for tools and equipment necessary for instruction, including (1) the number of students, (2) the available space, (3) the local budget, and (4) the objectives.

air compressor	hammers, claw
balance, triple-beam	hammers, sledge
blowers, gasoline-powered	hand lenses
boots, protective	hand truck
buckets, water	hard hats, protective
carpenter's line levels	hatchets
clipper, hand	heat mat, electric, with thermostat
clippers, hedge, electric	hedge trimmers, gasoline-powered
concrete mixer or soil batch mixer	helmets, safety
cords, extension	herbicide sprayers, hand
CPR equipment	hoes
cyclone seeder, shoulder-carry	ladder, extension
drill bit set, 1/16-1/2-inch	ladder, step
drills, 3/8-inch portable	mask respirators
drive socket sets, 1/4-inch and 3/8-inch	microscope, compound
edgers, gasoline-powered	microscope, dissecting
file sets	mist system, automatic
first-aid kits	pH meter
forks, spading and manure	pipe cutter
garbage cans for storage, plastic	pipe wrench (10-, 14-, 24-inch set)
gasoline containers, 2 1/2-gallon	pliers set
gloves, protective	posthole diggers
goggles, clear plastic	pot grips
grafting tools	power sprayer, 25-gallon
greenhouse	rakes, garden
greenhouse carts with pneumatic tires	respirators
greenhouse: cooling system, controls, and benches for 20-foot-by-40-foot greenhouse	ripsaws, hand
greenhouse heaters, pans, mist system	rotary mowers, 21-inch, gasoline-powered
grinding dressers, abrasive	saws, pruning
hacksaws	scales, utility
hammers, ballpeen	screwdriver sets
	shade area, 40-feet-by-40-feet
	shade cloth, black

sharpening stones
 shears, hedge
 shears, lopping
 shears, pruning
 shovels, round-point
 shovels, square-point
 sieve, hand
 soil samplers, tube
 soil tiller
 sol-u-bridge
 spades
 spray suit
 spreader, cyclone push-type
 squares, combination
 stereomicroscopes with light and cases
 tapes, 100-foot
 thermometers, high/low recording
 thermometer, soil
 time clock, fast cycle, adjustable for mist control

time clock, 24-hour
 tools set, small, gas-engine
 tractor
 tractor blade, front-end loader
 trailer
 trowel
 trowel set
 truck
 utility funnels
 vacuum, shop
 vises, machinist
 water hoses, 50-foot
 water nozzles, fog-it
 weed cutters, gasoline-powered
 wheelbarrows, contractor-type
 wrench set, box end
 wrench sets, adjustable

Classroom

Classroom resources, including equipment and supplies, should be provided and utilized to enable the instruction to meet program objectives. Such equipment may include, but is not limited to:

acetate (for transparencies)
 adding machine
 blackout curtains
 bulletin files, legal size, with dividers and inserts, 4-drawer
 bulletin files, letter size, 4-drawer
 cabinet, glass-front display
 cabinets, storage, for slides and filmstrips
 cabinets, storage, for transparencies
 cabinets, storage, 36-by-21-by-78-inch
 cassettes
 chairs, straight
 chairs, swivel
 clips, paper
 desk, teacher's
 diskettes, floppy
 file cabinet, 4-drawer
 file folders and labels
 filmstrip previewer

filmstrip projector
 lectern, speaker's
 magazine rack
 microcomputer with monitor, CD Rom drive, printer, and modem
 notebook rack
 paper, line-printer
 paper, microcomputer printer
 paper, photocopy
 paper punch, 3-hole
 pencil sharpener
 pencils (grease) or pens (transparency)
 postal scales
 projection screen, 70-inch-by-70-inch
 projector, overhead
 projector, slide, with timer and synchronizer
 ribbons, line printer
 ribbons, microcomputer printer
 rubber bands

rulers
scissors
slide previewer
tables, classroom, 30-inch-by-60-inch
table, typewriter
tables, projection
tables, work and study, two-person

tape and tape dispenser
tape recorder
thumb tacks
towels, paper
typewriter
VCR equipment (player, monitor,
camera)
VCR tape

Safety

Although no specific safety regulations have been mandated for Environmental Horticulture programs, it is suggested that strict adherence to the general standards contained in the Florida Department of Education *Educational Facilities: Public Schools & Community Colleges Rules of Florida State Board of Education (Administrative Code), Ch. 6A-2*, be practiced (e.g., first-aid kits in classrooms, adequate fire extinguishers, fire-evacuation plan). In addition, since working with machinery and other agriculture-related facilities is an integral part of this program, special efforts must be made to ensure student safety and well-being.

S.B.E. Rule 6A-2.097. Safety devices in shops, laboratories, and other process areas:

- (1) Use of personal protection devices and other protective equipment is required when persons are exposed to the following:
 - (a) arc welding, heavy gas cutting, scarfing
 - (b) spot welding, brazing, or cutting
 - (c) machining of any materials causing flying chips
 - (d) injurious radiations, dusts, fumes, gases, vapor mists
 - (e) sledging, hammering, chipping, scaling, drilling, grinding, chiseling, wire brushing, and caulking operations where flying objects or particles may strike the body
 - (f) chemicals, acids, caustics, and molten metals.
- (2) Personal protection devices which come in contact with the skin shall be sanitized after each use.
- (3) Clothing, jewelry, and personal grooming of personnel in shops and labs shall not constitute a hazard.
- (4) Individual equipment power shut-off, within reach of the operator, shall be provided for all working machinery. Each individual machine shall be equipped with an approved electromagnetic starter switch.

- (5) No safeguard, safety appliance, or safety device guarding a machine or machine part shall be removed or made ineffective except when the machine is stopped and for the purpose of immediate cleaning, repairing, or adjusting. Upon completion of repairing, cleaning, or adjusting, such guard, appliance, or device shall immediately be replaced. Any shop or laboratory tool or equipment found to be unsafe shall be red-tagged and removed from service until the condition is corrected.
- (6) The floors in areas where machines are used shall be kept free from waste, grease, and obstructions.
- (7) Welding operations shall be located in a shielded area, and the area shall be free of combustible material and persons not wearing protective devices. Fume removal and venting to the exterior shall be provided.
- (8) Areas where toxic fumes are produced shall be properly vented to the outside.
- (9) Flammable fumes or dust produced in a student-occupied facility shall be mechanically exhausted to the outside with approved explosion-proof, motor-driven equipment (of sufficient capacity to effectively remove fumes or dust) and with filters in place.
- (10) Each space equipped with unprotected gas valves accessible to students shall have an approved master cut-off readily accessible to the instructor.
- (11) Each shop or lab equipped with electrically powered machinery accessible to students shall have one (1) or more conspicuously color-coded emergency disconnect switches at convenient locations throughout the space. (Ordinary office machines, domestic sewing machines, and other such nonhazardous machines are not included in this requirement.)
- (12) Kilns shall be properly shielded from combustibles, combustible surfaces and personnel, and shall not be located in the path of or adjacent to any means of egress, or exposed to unauthorized persons.
- (13) Automotive, body and frame repair areas requiring welding and cutting shall be separated from engine overhaul and related fuel handling activities.
- (14) A tire cage shall be provided when pressurizing tires on split rims.
- (15) Vehicle lifts shall be provided with a mechanical safety lock.
- (16) Piping and working machinery shall be identified as follows:
 - (a) Piping systems, except domestic hot and cold water, shall be visibly identified by legend, flow arrows, and color coding in accordance with ANSI A13.1, American National Standard Scheme for Identification of Piping Systems, 1981 (see Rule 6A-2.050, FAC). Purchased, preprinted pipe markers meeting the above requirements and applied per manufacturer's instructions are acceptable. Field stenciling, when used, may delete color coding when legend clearly identifies pipe contents and flow arrows are included.
 - (b) Working machinery and component parts shall be safety color-coded per ANSI Z53.1, American National Standard Safety Color Code for Marking Physical Hazards, 1979 (see Rule 6A-2.050, FAC).
- (17) The safety color-coded chart shall be posted in a conspicuous place available to employees and students.
- (18) Hazardous work and storage areas shall be identified by appropriate caution signs.

- (19) All equipment designed to be permanently mounted shall be securely fastened to its supporting surface.
- (20) Safety-zone lines shall be used on the floor area surrounding working machinery.
- (21) Fume hoods shall be provided and kept in proper operating condition.
Operations where flammable gas, toxic vapors, or noxious odors are given off shall be performed in fume hoods specifically designed for the intended use.
- (22) Safety equipment such as showers and floor drains, eye wash, fire blankets, and proper extinguishing equipment shall be provided in areas where dangerous chemicals are used by students, and shall be properly installed and maintained.

Specific Authority 229.053(1), 235.01(2) FS. Law Implemented 235.01, 235.014(11), 235.06, 235.26, 240.293, 240.327 FS. History - New 6-10-75, Amended 9-6-78, 6-21-83, Formerly 6A-2.97, Amended 4-10-86.

c.f. ANSI Z53.1, American National Standard Safety Color Code for Marking Physical Hazards, 1979.

ANSI A13.1, American National Standard Scheme for the Identification of Piping Systems, 1981.

PROGRAM IMPLEMENTATION

Agriculture Enhancement Teaching-Learning Plans

Teaching-learning plans are designed for teacher use in managing instruction. Through the pilot project for the enhancement of vocational agriculture education, teaching-learning plans have been developed for each SPS in this program. These plans include the appropriate intended outcome and SPS, the enabling objectives, which clarify what students will know or be able to do, the equipment, tools, and materials needed to teach the SPS, suggested references and texts, teaching and learning activities for the classroom and the laboratory, and three sample test items. These materials are available through the occupational program specialist at DVACE. A sample is included in Appendix A.

Student Learning Guide

A student learning guide provides students with directions to help them manage their own learning. Tasks are broken down into steps, and resources as well as self-checks are provided. A sample student learning guide is provided in Appendix B as an example for you to use when developing or adapting a set of learning guides or modules. This sample guide presents the major components of a competency-based student learning guide. For further information, see the *Florida Vocational Program Implementation Guide*.

Student Organization Participation

The vocational student organizations associated with the Environmental Horticulture program are FFA and the National Postsecondary Agriculture Student Organization. These organizations are cocurricular, and participation is considered an integral part of the instructional program.

Refer to the *Florida Vocational Program Implementation Guide* for more information.

PROFESSIONAL CONSIDERATIONS

Teacher Certification

Listed below are the certification coverages included in the current *Course Code Directory* for Environmental Horticulture:

10-12, 30, 31 VOC AGRI @4 HORTICULT #7	AGRI @4 AGRICULTUR 1 2
30, 31 VOC AGRI @4 HORTICULT @7 G	AGRI @2 @4 AGRICULTUR 1 2

Professional Organizations and Support Services

Abraham Baldwin Agricultural College
ABAC Station
Tifton, GA 31793

American Association of Nurserymen
1250 I Street, Northwest, Suite 500
Washington, DC 20005

BPI ... A Grower's Organization
P.O. Box 286
Okemos, MI 48864

Commissioner of Agriculture
Capitol Building
Tallahassee, FL 32301

Department of Agricultural and Extension Education
305 Rolfs Hall
University of Florida
Gainesville, FL 32611

Division of Vocational, Adult, and Community Education
Florida Department of Education
Florida Education Center
Tallahassee, FL 32399

Florida A&M University
M. L. King, Jr., Boulevard
Tallahassee, FL 32307

Florida Association of Conservation Districts
P.O. Box 1269
Gainesville, FL 32602

Florida Association, FFA
Suite 1224
Florida Education Center
325 West Gaines Street
Tallahassee, FL 32399-0400

Florida Council of Farmer Cooperatives
P.O. Box 730
Gainesville, FL 32602

Florida Department of Agriculture and Consumer Services
Division of Plant Industries
Conner Building
Gainesville, FL 32602

Florida Farm Bureau Federation
P.O. Box 730
Gainesville, FL 32602

Florida Fern Growers Association
P.O. Box 3426
DeLand, FL 32723-3426

Florida FFA Foundation
First Florida Bank Building
150 3rd Street, Southwest
Winter Haven, FL 33880

Florida Flower Association
P.O. Box 1669
Ft. Myers, FL 33902

Florida Foliage Association
57 East 3rd Street
P.O. Box 2507
Apopka, FL 32703

Florida Forestry Association
P.O. Box 1696
Tallahassee, FL 32302

Florida Fruit and Vegetable Association
P.O. Box 20155
Orlando, FL 32814

Florida Irrigation Society
6500 Eloise Loop Road
Winter Haven, FL 33880

Florida Nurserymen and Growers Association
5401 Kirkman Road, Suite 650
Orlando, FL 32819

Florida Ornamental Growers Association
P.O. Box 236
Terra Ceia, FL 33570

Florida Retail Federation
P.O. Box 10024
Tallahassee, FL 32302

Florida Seedsmen and Garden Supply Association
P.O. Box 368
Yalaha, FL 34797

Florida State Florists Association
P.O. Box 2723
Winter Park, FL 32790

Florida Turfgrass Association
302 South Graham Avenue
Orlando, FL 32803-6332

Florida Vocational Agriculture Teachers Association
(address rotates with current officers)

Instructional Materials Service
305 Rolfs Hall
University of Florida
Gainesville, FL 32611

Professional Plant Grower's Association
P.O. Box 27517
Lansing, MI 48909

Southern Nurserymen's Association
3813 Hillsboro Avenue, Suite 227
Nashville, TN 37215

INSTRUCTIONAL RESOURCES

Listed on the following pages are teacher-recommended materials for teaching Environmental Horticulture. If you are interested in obtaining any of the materials, refer to the source listing that follows or to the list of professional organizations.

Teacher-Recommended Materials

AUDIOVISUALS (AV) and COMPUTER SOFTWARE (CS)

<u>Title</u>	<u>Format</u>	<u>Source*</u>	<u>Year</u>
<i>Aquatic Weed Data Base</i>	CS	IFAS	1988
<i>Automatic Sprinkler Scheduling</i>	AV	VEP	1987
<i>Bacterial Diseases</i>	AV	Florida Foliage Association	nd
<i>Balling and Burlapping Trees and Shrubs</i>	AV	University of Illinois	1971
<i>Basic Ecology</i>	AV	VEP	1978
<i>Careers in Ornamental Horticulture</i>	AV	VEP	1969
<i>Common Horticultural Hand Tools</i>	AV	Singer	1980
<i>Components of IPM, Parts I & II</i>	AV	VEP	1981
<i>Efficient Water Management in the Landscape</i>	AV	VEP	1989
<i>Elements of Pruning</i>	AV	VEP	1972
<i>Fertilizing Ornamental Plants</i>	AV	VEP	1972
<i>Florida Aquatic Plant Story</i>	AV	IFAS	1990
<i>Florida Water Story, Parts I-IV</i>	AV	local water management district	1986

*The source listed for each title provides only one option for obtaining materials. It is not the *only* source, nor does its listing here represent an endorsement.

<u>Title</u>	<u>Format</u>	<u>Source</u>	<u>Year</u>
<i>Foliage Plant Identification, Parts I, II, III</i>	AV	University of Illinois	1969-70
<i>Fundamentals of Plant Identification</i>	AV	Ohio State	1967
<i>Greenhouses and Related Structures</i>	AV	Ohio State	1982
<i>Greenhouse Uses and Design</i>	AV	University of Illinois	1971
<i>How to Prevent On-the-Job Back Injuries</i>	AV	Idea Bank	1987
<i>Human Ecology</i>	AV	VEP	1978
<i>Identification of Flowers and Inflorescences</i>	AV	University of Illinois	1982
<i>Insect Control Data Base</i>	CS	IFAS	1988
<i>Insect Identification</i>	AV	VEP	1984
<i>Integrated Pest Management</i>	AV	VEP	1989
<i>Introduction to IPM</i>	AV	VEP	nd
<i>Landscape Drip Design</i>	AV	Rainbird	1984
<i>Landscape Irrigation Maintenance and Troubleshooting</i>	AV	VEP	1988
<i>Landscape Irrigation Systems, Parts I, II, III, IV</i>	AV	VEP	1981
<i>Mathematics for Horticulture</i>	CS	Mid-States Agri-Technology Association	1982
<i>Nematode Data Base</i>	CS	IFAS	1988
<i>Nutritional Deficiency</i>	CS	IFAS	1987

<u>Title</u>	<u>Format</u>	<u>Source</u>	<u>Year</u>
<i>Photosynthesis & Respiration</i>	AV	RMI	1978
<i>Physiological Diseases of Foliage Plants</i>	AV	Florida Foliage Association	nd
<i>Plant Cost Estimator</i>	CS	IFAS	1986
<i>Plant Disease Data Base</i>	CS	IFAS	1988
<i>Plant Identification</i>	AV	VEP	1990
<i>Planting and Care of Hanging Baskets</i>	AV	University of Illinois	1976
<i>Plant Movement and Transportation</i>	AV	VEP	1978
<i>Plant Nutrients in the Environment</i>	AV	University of Illinois	1972
<i>Propagating Ornamental Plants</i>	AV	VEP	1972
<i>Propagation by Air Layering</i>	AV	University of Illinois	1968
<i>Romancing the Seed</i>	AV	VEP	1988
<i>Select a Plant Data Base</i>	CS	IFAS	1988
<i>Selecting and Handling Pesticides</i>	AV	University of Illinois	1978
<i>Soil Borne Diseases of Foliage Plants</i>	AV	Florida Foliage Association	nd
<i>Soil Color</i>	AV	University of Illinois	1964
<i>Soil Structure</i>	AV	University of Illinois	1959

<u>Title</u>	<u>Format</u>	<u>Source</u>	<u>Year</u>
<i>Soils for Plant Growth: Container Soils</i>	AV	University of Illinois	1981
<i>Soils for Plant Growth: Modifying Container Soils</i>	AV	University of Illinois	1981
<i>Soil Texture</i>	AV	University of Illinois	1960
<i>Taking Good Soil Samples and Interpreting Results</i>	AV	RMI	1986
<i>Turf Irrigation Design</i>	AV	Rainbird	1984
<i>Water and Plant Growth</i>	AV	VEP	No longer available from VEP
<i>Weed Control Data Base</i>	CS	IFAS	1988
<i>What Is Horticulture?</i>	AV	Ohio State University	No longer available from OSU
<i>Xeriscape: Appropriate Landscaping to Conserve Water</i>	AV	VEP	1989

PRINT

<u>Author</u>	<u>Title</u>	<u>Publisher</u>	<u>Year</u>
Bland, Roger G.; Jaques, H. E.	<i>How to Know the Insects</i>	Wm. C. Brown Company	1978
Boodley, James W.	<i>The Commercial Greenhouse</i>	Delmar Publishers, Inc.	1981

<u>Author</u>	<u>Title</u>	<u>Publisher</u>	<u>Year</u>
Brown, Arlen D.; Strickland, R.	<i>Tractor and Small Engine Maintenance</i> , 5th ed.	Interstate Printers and Publishers	1983
Camp, William; Daugherty, Thomas	<i>Managing Our Natural Resources</i> , 2nd ed.	Delmar Publishers, Inc.	1991
CIDS	<i>Dig Manual</i>	State of Florida	1977
Conner, Wesley E.	<i>The Backpocket Guide to Ornamental Plants</i>	VEP	1979
Cooper, Elmer	<i>Agriscience, Fundamentals and Applications</i>	Delmar Publishers, Inc.	1990
Dirr, Michael A.; Heuser, Charles W.	<i>The Reference Manual of Woody Plant Propagation</i>	Varsity Press	1987
Dressler, Robert; Hall, David W.; Perkins, Kent D.; Williams, Norris H.	<i>Identification Manual for Wetland Plant Species of Florida</i>	IFAS	1987
Gore, Dorothy J.; Kircher, Harry B.; Wallace, Donald L.	<i>Our Natural Resources and Their Conservation</i> , 6th ed.	Interstate Printers and Publishers	1988
Halfacre, Gordon R.	<i>Landscape Plants of the Southeast</i> , 5th ed.	Sparks Press	1989
Hartmann, Hudson T.; Kester, Dale E.	<i>Plant Propagation: Principles and Practices</i> , 4th ed.	Prentice-Hall	1983
Jacobs, C. O.; Harrall, W. R.	<i>Agricultural Power and Machinery</i>	McGraw-Hill Book Company	1983
Krebs, Alfred H.	<i>Agriculture in Our Lives</i> , 5th ed.	Interstate Printers and Publishers	1984

<u>Author</u>	<u>Title</u>	<u>Publisher</u>	<u>Year</u>
Kyte, Lydianna	<i>Plants from Test Tubes: An Introduction to Micro-propagation</i>	Timber Press	1987
Mattoon, Wilbur R.	<i>Forest Trees of Florida</i>	Florida Department of Agriculture	nd
Maxwell, Lewis S.	<i>Florida Trees and Palms</i>	Maxwell	1984
-----	<i>Florida Insects</i>	Maxwell	1987
-----	<i>Florida Plant Selector</i>	Maxwell	1980
-----	<i>Florida Fruit</i>	Maxwell	1980
-----	<i>Florida Flowers</i>	Maxwell	1987
McCarty, Lambert B.; Black, Robert J.; Ruppert, Kathleen C.	<i>Florida Lawn Handbook</i>	IFAS	1990
McCullough, Suzanne; Ruppert, Kathleen	<i>Botany Handbook of Florida</i>	IFAS	nd
McDaniel, Gary L.	<i>Ornamental Horticulture</i>	Reston	1982
Reiley, H.; Shry, Carroll	<i>Introductory Horticulture, 4th ed.</i>	Delmar Publishers, Inc.	1991
Shigo, Alex L.	<i>A New Tree Biology</i>	Shigo & Trees Associates	1989
State of Oklahoma	<i>Agriculture, I-IV</i>	Oklahoma Department of Vocational and Technical Education	1984
USDA, EPA	<i>Applying Pesticides Correctly: A Guide for Private and Commercial Applicators</i>	IFAS	1974

<u>Author</u>	<u>Title</u>	<u>Publisher</u>	<u>Year</u>
Ware, George W.	<i>Complete Guide to Pest Control: With and Without Chemicals</i>	Thomson Publications	1980
Watkins, James A.	<i>Turf Irrigation</i>	Telsco	1978
Watkins, John V.; Sheehan, Thomas J.	<i>Florida Landscape Plants</i>	University of Florida	1975
Whitcomb, Carl E.	<i>Plant Production in Containers</i>	Lacebark Production	1988

Sources of Print and Audiovisual Materials and Software

Listed on the following pages are sample material sources that are available for Environmental Horticulture. Additional resources may be available from other sources, including professional and trade organizations. You are encouraged to seek catalogs from these firms so that you become familiar with available materials.

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
American Association for Vocational Instructional Materials (AAVIM) 745 Gaines School Road Athens, GA 30605	X	X	X
American Vocational Association Agricultural Education Division 1410 King Street Alexandria, VA 22314	X	--	--
AVI Publishing Company Inc. 115 Fifth Avenue New York, NY 10003-1004	X	--	--
Bergwall Productions c/o D. C. Jaegar Corporation 135 North Knowles Avenue Winter Park, FL 32789	--	X	X
Banyan Books P.O. Box 431160 Miami, FL 33143	X	--	--

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
Career Aids 20417 Nordhoff Street Chatsworth, CA 91311	--	X	X
Career Research Corporation CHOICE Division 65 West Gordon Avenue Salt Lake City, UT 84107	X	X	--
Cornell University Instructional Materials Service Department of Education Academic I, Cornell University Ithaca, NY 14853	X	X	--
Delmar Publishing, Inc. 2 Computer Drive, West Albany, NY 12212	X	--	--
Doubleday and Company, Inc. 501 Franklin Avenue Garden City, NY 11530	X	--	--
Duke University Press 6697 College Station Durham, NC 27708	X	--	--
Encyclopaedia Britannica Educational Corporation 310 South Michigan Avenue Chicago, IL 60604	X	--	X
Florida Department of Agriculture Division of Forestry Collins Building Tallahassee, FL 32301	X	--	--
Florida Department of Agriculture Division of Plant Industries P.O. Box 1269 Gainesville, FL 32602	X	--	--

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
Florida Department of Education Division of Vocational, Adult, and Community Education Bureau of Career Development Florida Education Center 325 West Gaines Street Tallahassee, FL 32399	X	--	--
Florida Department of Natural Resources Marjory Stoneman Douglas Building 3900 Commonwealth Boulevard Tallahassee, FL 32399	X	--	--
Florida State University Center for Instructional Development and Services 2003 Apalachee Parkway Tallahassee, FL 32301	--	X	--
Future Farmers of America National FFA Supply Service P.O. Box 15159 Alexandria, VA 22309	X	X	--
Georgia Department of Education 1766 Twin Towers, East Atlanta, GA 30334	X	--	--
Glencoe/McGraw-Hill 15319 Chatsworth Street P.O. Box 9509 Missions Hills, CA 91395-9509	X	X	X
Hobar Publications 1234 Tiller Lane St. Paul, MN 55112	X	--	X
The Idea Bank P.O. Box 23994 Tempe, AZ 85282	--	X	--

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
IFAS Editorial Department Building 116, Mowry Road University of Florida Gainesville, FL 32611	X	X	X
Interstate Printers and Publishers 19 North Jackson Street Danville, IL 61832	X	--	--
Iowa Curriculum Assistance System College of Education N008 Lagomarcino Hall Iowa State University Ames, IA 50011	X	--	--
John Deere Company 1400 Third Avenue Moline, IL 61265	X	--	--
Kentucky Department of Education Curriculum Development Center Office of Vocational Education 2024 Capital Plaza Tower Frankfort, KY 40601	X	--	--
Lacebark Productions Route 5, P.O. Box 174 Stillwater, OK 74074	X	--	--
Lewis S. Maxwell 6230 Travis Boulevard Tampa, FL 33610	X	--	--
McGraw-Hill Publishing Company 13955 Manchester Road Manchester, MO 63011	X	--	--
Michigan State University Cooperative Extension Service Agricultural Experiment Station East Lansing, MI 48824-1039	X	--	--

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
Michigan Vocational Education Career Education Resource Center 133 Erickson Hall Michigan State University East Lansing, MI 48824	X	--	--
Mid-America Vocational Curriculum Consortium (MAVCC) 1500 West Sixth Avenue Stillwater, OK 74074	X	--	--
Mississippi State University MS Cooperative Extension Service Box 5446 Mississippi State, MS 39762	X	--	--
Modern Talking Picture Service 5000 Park Street, North St. Petersburg, FL 33790	--	X	--
National Audiovisual Center Customer Services PJ 8700 Edgeworth Drive Capitol Heights, MD 20743	--	X	--
National Audubon Society 950 Third Avenue New York, NY 10022	X	X	--
National Farm Book Company P.O. Box 206 5149 Highway T Amherst, WI 54406	X	--	--
National Geographic Society Educational Services Department 81 Washington, DC 20036	X	X	--
National Parks and Conservation Association 1701 18th Street, Northwest Washington, DC 20009	X	X	--

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
National Teaching Aids, Inc. 120 Fulton Avenue Garden City Park, NY 11040	X	X	--
National Wildlife Federation 1412 16th Street, Northwest Washington, DC 20036	X	--	--
NNCCVTE-Southeast Region Research and Curriculum Unit Drawer DX Mississippi State, MS 39762	X	--	--
Ohio State University Instructional Materials Lab 842 West Goodale Boulevard Columbus, OH 43212	X	X	--
Oklahoma State Department of Vocational and Technical Education 1500 West Seventh Avenue Stillwater, OK 74074	X	X	--
Photocom P.O. Box 3135 Pismo Beach, CA 93448-1135	--	--	X
Prentice Hall/Reston Publishing Route 9W Englewood Cliffs, NJ 07632	X	X	X
Rainbird Publishers P.O. Box 135 Inchelium, WA 99138	X	--	--
RMI Media Production, Inc. 2807 West 47th Street Shawnee Mission, KS 66205	--	X	--
Shigo Trees Associates 4 Denbow Road Durham, NH 03824	X	--	X

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
Singer Publishing 213 Desert Lakes Drive Rancho Mirage, CA 92270	X	X	--
Society of American Foresters Texas A&M University Instructional Materials Services FE Box 2588 College Station, TX 77843-2588	X	--	--
Soil and Water Conservation Society 7515 Northeast Ankeny Road Ankeny, IA 50021-9764	X	--	--
Sparks Press 900 West Morgan Street P.O. Box 26747 Raleigh, NC 27611	X	--	--
Superintendent of Documents U.S. Government Printing Office Washington, DC 20402	X	--	--
Texas A&M University Instructional Materials Services FE Box 2588 College Station, TX 77843-2588	X	X	--
Thomson Publications P.O. Box 9335 Fresno, CA 93791	X	--	--
Timber Press 9999 Southwest Wilshire Portland, OR 97225	X	--	--
University of California Division of Agriculture & Natural Resources Publications 6701 San Pablo Avenue Oakland, CA 94608	X	--	--

	<u>Print</u>	<u>Audiovisual</u>	<u>Software</u>
University of Florida Press 15 Northwest 15th Street Gainesville, FL 32603	X	--	--
University of Michigan Film and Video Library 400 Fourth Street Ann Arbor, MI 48103-4816	--	X	--
University of Missouri at Columbia Instructional Materials Laboratory 10 Industrial Education Building Columbia, MO 65211	X	X	--
Varsity Press 1240 Hollow Creek Lane Watkinsville, GA 30677	X	--	--
Vocational Agriculture Services University of Illinois 1401 South Maryland Drive Urbana, IL 61801	X	X	X
Vocational Education Productions (VEP) California Polytechnic State University San Luis Obispo, CA 93407	X	X	--
V-TECS Curriculum Publications Clearinghouse Western Illinois University Horrabin Hall, 46 Macomb, IL 61455	X	--	--
William C. Brown, Publisher 2460 Kerper Boulevard Dubuque, IA 52001	X	--	--

FEIS Services

FLORIDA EDUCATIONAL INFORMATION SERVICE
2003 Apalachee Parkway
Tallahassee, FL 32301
(904) 487-2054

If you need (1) information about copyright; (2) a list of instructors teaching Environmental Horticulture programs in Florida; (3) journal articles or project reports on specific topics; (4) curriculum and instructional materials; or (5) information on current trends, issues, and research, please contact the Florida Educational Information Service (FEIS), Center for Instructional Development and Services, College of Education, Florida State University, 2003 Apalachee Parkway, Tallahassee, Florida 32301; (904) 487-2054. FEIS will tailor its services to meet your needs for information concerning resource materials.

APPENDIX A

Sample Teaching-Learning Plans for Environmental Horticulture

Agriculture Enhancement Teaching-Learning Plans

Teaching-learning plans are designed for teacher use in managing instruction. Through the pilot project for the enhancement of vocational agriculture education, teaching-learning plans were developed for each Student Performance Standard (SPS) in this program. These plans include the appropriate intended outcome and SPS; the enabling objectives that clarify what students will know or be able to do; the equipment, tools, and materials needed to teach the SPS; suggested references and texts; teaching and learning activities for the classroom and the laboratory; and three sample test items. These materials are available through the occupational program specialist at DVACE.

PROGRAM TITLE: Environmental Horticulture

COURSE TITLE: Agriscience Foundations

INTENDED OUTCOME: 02.00 Apply important scientific and technological principles to agribusiness and natural resources.

STUDENT PERFORMANCE STANDARD: 02.07 Describe how water, carbon, nitrogen, oxygen, sulfur, and phosphorus are recycled naturally.

ENABLING OBJECTIVE:

Diagram each of the cycles.

EQUIPMENT/TOOLS/MATERIALS/NEEDED:

books, chalkboard, and chalk

TEACHING-LEARNING ACTIVITIES (CLASSROOM OR LAB):

1. Read pages 29-56 in the book *Introduction to Environmental Science* by Moran.
2. Read pages 889-891 in the book *Managing Our Natural Resources* by Camp.
3. Trace the route that phosphorus might follow as it cycles through a terrestrial ecosystem. List at least four organisms in the cycle.
4. List and explain the steps in the hydrologic (water) cycle.

SAMPLE TEST ITEMS OR PERFORMANCE CHECKLIST:

1. What is the movement of water from lakes and streams into the atmosphere called?
 - A. condensation
 - B. evaporation*
 - C. hydration
 - D. transpiration
2. Which gas in the atmosphere contains the earth's major supply of carbon?
 - A. carbon monoxide
 - B. carbon dioxide*
 - C. carbon tetrachloride
 - D. carbon fluoride

3. In which of the following does nitrogen fixation in the atmosphere take place?

- A. hail
- B. lightening*
- C. rain
- D. smog

PROGRAM TITLE: Environmental Horticulture

COURSE TITLE: Environmental Horticulture I

INTENDED OUTCOME: 15.00 Control pests.

STUDENT PERFORMANCE STANDARD: 15.03 Classify insects according to feeding habits.

ENABLING OBJECTIVES:

1. Identify insect mouthparts.
2. Identify the plant part on which an insect is feeding.

EQUIPMENT/TOOLS/MATERIALS NEEDED:

hand lens 10x, dissecting microscope, damaged plants, insects, and visuals

TEACHING-LEARNING ACTIVITIES (CLASSROOM OR LAB):

1. Place an aphid feeding on a leaf under a dissecting microscope.
2. Place a caterpillar feeding on a leaf under a dissecting microscope.
3. Observe many insects under a dissecting microscope, and identify mouthparts as chewing or piercing/sucking.
4. Using infested plants or slides, identify the plant part (root, stems, leaves) on which the insect is feeding.

SAMPLE TEST ITEM OR PERFORMANCE CHECKLIST:

1. Where are aphids commonly found?
 - A. on new growth*
 - B. on the roots of plants
 - C. on top of foliage
 - D. underneath foliage
2. Which type of mouthparts do beetles, grasshoppers, and katydids have in common?
 - A. chewing*
 - B. piercing-sucking
 - C. rasping-sucking
 - D. siphoning

3. With which type of mouthpart does an aphid feed?

- A. chewing
- B. piercing-sucking*
- C. rasping-sucking
- D. siphoning

PROGRAM TITLE: Environmental Horticulture

COURSE TITLE: Environmental Horticulture I

INTENDED OUTCOME: 14.00 Irrigate plants and turfs.

STUDENT PERFORMANCE STANDARD: 14.02 Identify sources and quality of water for irrigation.

ENABLING OBJECTIVES:

1. Use solubridge to determine soluble salts in irrigation water.
2. Use colormetric tests to determine which salts are in irrigation water.

EQUIPMENT/TOOLS/MATERIALS NEEDED:

solubridge, colormetric comparator, and water samples

TEACHING-LEARNING ACTIVITIES (CLASSROOM OR LAB):

1. Take a water sample from a pond and run water-quality tests.
2. Take a water sample from an irrigation source (pump) and run water-quality tests.
3. Take a tap-water sample and run water-quality tests.
4. Read pages 203-211 in the book *Foliage Plant Production* by Joiner.

SAMPLE TEST ITEM OR PERFORMANCE CHECKLIST:

1. Which common additive to municipal water systems can cause injury to many foliage plants?
 - A. fluoride*
 - B. hydrogen
 - C. oxygen
 - D. phosphorus
2. What is the process of removing harmful salts from water called?
 - A. deionization*
 - B. leaching
 - C. translocation
 - D. vernalization

3. Besides pH, what should water to be used for irrigation be tested for?

- A. insoluble salts
- B. soluble salts*
- C. specific gravity
- D. temperature

APPENDIX B

Sample Student Learning Guide for Environmental Horticulture

ABOUT STUDENT LEARNING GUIDES _____

As mentioned in the Instructional Approach section of the *Florida Vocational Education Program Implementation Guide*, competency-based vocational instruction (CBVI) is the most appropriate instructional approach to teaching students to become competent workers. In order to implement CBVI effectively and efficiently, you and the students should have access to competency-based instructional materials, such as student guides.

The following components are often included in a student learning guide:

The **introduction** includes the intended outcome, the SPS for which the guide is developed, and an introduction to the guide, stating why this topic is important to study and what this guide is about (other information, such as the relationship between this guide and other guides, can be included on this sheet also).

Objectives include both knowledge and performance objectives if the SPS calls for hands-on performance, but only knowledge objectives if the SPS requires knowledge-oriented competencies.

Resources include the instructional materials that students should study and the tools and supplies that students should have access to in order to complete this guide.

Learning activities include a list of steps that students should follow in order to master the objectives.

The **self-check** consists of questions designed to help students review.

The **activity sheet** is designed to help students practice hands-on tasks for performance objectives. (If the SPS does not require hands-on activity, this sheet is not included in the learning guide.)

Information sheets provide information, guidance, or summaries not available elsewhere. These are usually instructional resources for the knowledge objectives.

The **written test** measures student achievement on the knowledge objectives.

The **performance test** is designed to be used by the evaluator/instructor to assess the student's level of achievement on the performance objectives.

The student learning guide may consist of two or more sets of the above components if the objectives need to be divided into two or more groups. Whatever format you use for the student learning guide, these components should be included in order to provide for instructional events such as gaining attention, stating objectives, recalling prerequisites, providing instructional stimulus, providing learning guidance, eliciting performance, providing feedback, assessing performance, and enhancing retention and transfer.

STUDENT LEARNING PACKAGE NO.

Horticulture Department
Sarasota County Vocational Center
4748 Beneva Road/Sarasota, Florida 33583
(813) 924-1365

CORE



Horticulture

DUTY NO. 0600
TASK NO. 0601

PROGRAM NO.
CORE

PRIEREQUISITE

AVERAGE
HOURS

DATES
REVISED

1988

When you successfully **complete** this learning package, you will be able to

TASK:

INTERPRET INFORMATION IN A PESTICIDE LABEL

Why is it **important** for you to learn this task?

INTRODUCTION:

ANYONE USING PESTICIDES HAS THE RESPONSIBILITY TO HIMSELF OR HERSELF, AND TO OTHERS, TO FOLLOW PROCEDURES THAT AVOID UNNECESSARY HAZARDS TO PEOPLE, ANIMALS, OR THE ENVIRONMENT. IT IS SPECIALLY IMPORTANT THAT REGULAR USERS OF PESTICIDES BE WELL INFORMED AND FOLLOW APPROVED PRACTICES TO AVOID THE CUMULATIVE EFFECT OF LOW-LEVEL CONTAMINATION.

To show that you have **Mastered** this task, here is what you will be asked to do:

PERFORMANCE OBJECTIVE:

You Will Be Given: INSTRUCTION SHEETS, REFERENCES, SLIDES AND PESTICIDE LABELS

You Must: DESCRIBE PESTICIDE FORMULATIONS AND INTERPRET PESTICIDE LABEL INFORMATION

How well: MINIMUM GRADE OF 80% IN KNOWLEDGE AND PERFORMANCE TESTS.

Here is what you will be able to do when you complete each **Section** of this learning package:

SECTIONS:

1. DESCRIBE PESTICIDE FORMULATIONS

2. INTERPRET INFORMATION IN PESTICIDE LABEL

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SECTION NO.

When you complete this Section, you will be able to:

1. DESCRIBE PESTICIDE FORMULATIONS
2. INTERPRET INFORMATION IN PESTICIDE LABEL

Complete each of the Learning Activities listed below

LEARNING ACTIVITIES

DO the following things:

USE the following resources:

1. Read and study instruction sheet

1. SCVC Instruction Sheet No. 1
"PESTICIDE FORMULATIONS"

2. Read reference

2. "APPLYING PESTICIDES CORRECTLY,
A guide for Private and Commercial Applicators", pages 23-28

3. Complete self check and turn it in

3. Self Check No. 1
"DESCRIBE PESTICIDE FORMULATIONS"

4. Read and study instruction sheet

4. SCVC Instruction Sheet No. 2
"INTERPRETING INFORMATION IN
A PESTICIDE LABEL"

5. View slides

5. Slides/script set No. 206
"THE PESTICIDE LABEL"

6. Complete self check and turn it in

6. Self Check No. 2
"INTERPRET INFORMATION IN LABEL"

7. Take Performance Test

7. Performance Test No. 1
"INTERPRET INFORMATION IN A
PESTICIDE LABEL"

Prog.	Duty	Task	Page
CORE	0600	0601	2

INSTRUCTION SHEET

PESTICIDE FORMULATIONS

The main reference for this module is the publication APPLYING PESTICIDES CORRECTLY, A GUIDE FOR PRIVATE AND COMMERCIAL APPLICATORS. The subject of pesticide formulations is covered in pages 23 to 28. The notes in this instruction sheet are to supplement the reference listed. Check pages 126 to 128 of the reference for the meaning of terms used in pest control.

An emulsion is a mixture of two liquids, such as oil and water. Since normally oil and water separate, in order to maintain these two liquids mixed, the oil must be in such small drops that they will not float. Products known as emulsifiers cause the oil to break down in such small drops. So emulsions consist of a mixture of 3 products: water, oil and an emulsifier.

An emulsifiable concentrate is a concentrated product that will turn into an emulsion when mixed with water. Emulsifiable concentrates are oils in which a pesticide has been dissolved and an emulsifier has been added. The initials E or EC are used to indicate that the product is an emulsifiable concentrate. A number added to the initials indicates pounds of pesticide contained in one gallon of emulsifiable concentrate. Malathion 2 EC, means that 2 lbs of malathion are contained in 1 gallon of the emulsifiable concentrate.

Wettable powders are pesticide formulations frequently used. These carry the initials WP or W. Wettable powders are supposed to be mixed with water and applied as a spray. A type of detergent or wetting agent is added to the powder to facilitate the mixing. It is important to keep in mind that the powder does not dissolve in the water; making a solution such as sugar and water will do. The mixture of powder and water make a suspension, such as the muddy water made by mixing soil and water. Suspensions need to be stirred often to keep the powder from settling. Dusts are dry formulations that are intended for use as they come in the container without dilution. The active ingredient contained in the dust has already been diluted by mixing it with an inert powder such as talcum.

Let us compare SEVIN D 5% with SEVIN WP 50%. The wettable powder has a concentration of active ingredient 10 times stronger than the dust, because the wettable powder is supposed to be diluted with water. The dust is ready to apply as it comes. Never apply wettable powders as a dry dust to plants; it will be an extremely high rate of pesticide application.

Phytotoxicity refers to the toxic action of a pesticide on a plant. Emulsifiable concentrates are more likely to be phytotoxic than wettable powders. Wettable powders contain in addition to the pesticide: talcum and wetting agents. These two products are not likely to be phytotoxic.

Prog	Duty	Task	Page
CORE	0600	0601	3

INSTRUCTION SHEET

(continued)

However, emulsifiable concentrates contain in addition to the pesticide: oil and an emulsifier. Both of these products tend to be phytotoxic. Keep in mind the greater risk of phytotoxicity when emulsifiable concentrates are used.

Prog.	Duty	Task	Page
CORE	0600	0601	4

SELF-CHECK NO. :**DIRECTIONS:**

Information needed to answer these questions is in the reference **APPLYING PESTICIDES CORRECTLY, A GUIDE FOR PRIVATE AND COMMERCIAL APPLICATORS**, pages 23 to 28 and pages 125 to 128. Use also Instruction Sheet No. 1.

1. Which formulations are represented by the following initials?

INITIALS	TYPE OF FORMULATION
EC	
G	
D	
P	
WP	
B	
S	
LV	

2. How much Malathion is contained in 1 gallon of Malathion EC 4?

A. 4%

C. 4 pints

B. 4 ounces

D. 4 pounds

3. Which formulation requires no mixing?

A. soluble powder

C. soluble powder

B. Ultra low volume

D. dust

4. What is a pesticide formulation?

A. the concentration of a poison

B. the product that kills pests

Prog	Duty	Task	Page
CORE	0600	0601	2

SELF-CHECK NO. 1

(continued)



4. (continued)

C. the formula of the material considered to be the active ingredient

D. the mixture of active and inactive ingredients

5. Which formulation is mixed with water?

A. Baits

C. Granules

B. Dusts

D. Wettable powders

6. Which formulation of a given pesticide is most phytotoxic?

A. EC is more phytotoxic than WP

B. WP is more phytotoxic than EC

C. EC and WP are equally phytotoxic

7. Which formulation requires most agitation while it is being applied?

A. S

C. EC

B. WP

D. SP

8. Which formulation represents the greatest hazard for the applicator?

A. Dust

C. Emulsifiable concentrate

B. Granules

D. Fumigant

9. Which formulation has the lowest concentration of active ingredient?

A. Dust

C. Ultra low volume

B. Wettable powder

D. Emulsifiable concentrate

Prog	Duty	Task	Page
CORE	0600	0001	6

SELF-CHECK NO. 1

(continued)



10. Which formulation will have the least risk of drift?

- A. Dust
- B. Emulsifiable concentrate
- C. Granules
- D. Fumigant

11. Which formulation is used in seed treatment?

- A. WP
- B. B
- C. D
- D. EC

12. Which formulation is used for soil applications?

- A. G
- B. WP
- C. D
- D. EC

13. Which formulation is used for control of slugs?

- A. D
- B. EC
- C. WP
- D. B

14. Which formulation will not be adequate for foliage application?

- A. EC
- B. G
- C. D
- D. WP

15. A small airplane is to be used over a swamp applying pesticide to control mosquitoes. Select the formulation that will weigh the least?

- A. D
- B. EC
- C. ULV
- D. WP

16. Which type of formulation is most phytotoxic?

- A. Dust
- B. Emulsifiable concentrate
- C. Granules
- D. Wettable

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CORE	0.00	0601	7

INSTRUCTION SHEET

No. 2

INTERPRETING INFORMATION ON A PESTICIDE LABEL

The label on a pesticide container is a legal document. You must follow its instructions or you are subject to either civil or criminal penalties. Failure to follow label instructions when using a pesticide is a violation of the law.

Read the label carefully before you buy the pesticide. Read it again before mixing, applying pesticides, and again before storing or disposing of pesticides. Follow label instructions carefully to use the pesticide safely and correctly.

The examination required to obtain a Private Pesticide Applicators License is based on information contained in the publication: APPLYING PESTICIDES CORRECTLY, A GUIDE FOR PRIVATE AND COMMERCIAL APPLICATORS. The chapter LABELS AND LABELING, pages 29 to 35, of this publication is the main reference for this module. As you read this chapter find the answers for Self Check No. 2.

On pages 125 to 128 you will find the meaning of many terms used in pest control.

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SELF-CHECK NO. 2



DIRECTIONS:

USE THE INFORMATION CONTAINED IN THIS PESTICIDE LABEL TO ANSWER QUESTIONS IN SELF CHECK NO. 2

Pramitol®

80 WP

SAMPLE LABEL

Herbicide

For weed control on railroad rights-of-way and industrial sites

Controls johnson-grass, bindweed and other hard-to-kill weeds

25 Pounds
Net Weight

Active Ingredient:
Prometon: 2,4-bis
(isopropylamino)-6-
methoxy-s-triazine 80%
Inert Ingredients: 20%
Total: 100%

EPA Est. No. 100-AL-1
EPA Reg. No. 100-536-ZA
Control No. 50590

Pramitol 80WP is a wettable powder.

Warning:

Keep out of reach of children.

See additional warning statements on back of bag

See directions for use on back of bag

CIBA-GEIGY

Used with permission
of CIBA-GEIGY.

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CORE	0600	0601	9

SELF-CHECK NO. 2

(continued)



DIRECTIONS FOR USE AND CONDITIONS OF SALE AND WARRANTY

IMPORTANT: Read the entire Directions for Use and the Conditions of Sale and Warranty before using this product.

Conditions of Sale and Warranty

The Directions for Use of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials or the manner of use or application all of which are beyond the control of CIBA-GEIGY or the Seller. All such risks shall be assumed by the Buyer.

CIBA-GEIGY warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the Directions for Use, subject to the inherent risks referred to above. CIBA-GEIGY makes no other express or implied warranty of Fitness or Merchantability or any other express or implied warranty. In no case shall CIBA-GEIGY or the Seller be liable for consequential, special, or indirect damages resulting from the use or handling of this product. CIBA-GEIGY and the Seller offer this product and the Buyer and user accept it, subject to the foregoing Conditions of Sale and Warranty which may be varied only by agreement in writing signed by a duly authorized representative of CIBA-GEIGY.

General Information

Pramitol 80WP is a nonselective herbicide that may be applied in water or phytotoxic oil before or after plant growth begins. When applied with water as the carrier, Pramitol 80WP has minimal activity through foliar contact. Much of its activity is through plant roots; therefore, its effectiveness is dependent on rainfall to move it into the root zone. Very dry soil conditions and lack of sufficient rainfall may result in poor weed control.

Use only in areas where complete control of all vegetation is desired, such as industrial sites, rights-of-way, lumberyards, petroleum tank farms, around farm buildings, along fence lines, etc. When applied to the soil, this product usually inhibits plant growth for a year or more. Pramitol 80WP should not be used on land to be cropped, or near adjacent desirable trees, shrubs or plants, or injury may occur.

Pramitol 80WP is noncorrosive to equipment and metal surfaces, nonflammable, and has low electrical conductivity.

Mixing Instructions

Pramitol 80WP is a wettable powder that should be mixed with water or phytotoxic oil and applied as a spray. Make a slurry by adding Pramitol 80WP to water or phytotoxic oil. Pour the slurry into the spray tank during or after filling. Sufficient hydraulic (jet) or mechanical agitation must be provided during mixing and application to keep the material in suspension. Wash sprayer thoroughly after use.

Directions for Use

Industrial Sites and Noncrop Areas

Apply Pramitol 80WP prior to or up to 3 months after weed emergence. Application rates vary from 12 to 24 lbs. of Pramitol 80WP per acre, depending on climatic conditions, soil conditions, weeds present and the stage of growth of the weeds. In the following are recommendations. The higher rates are intended for use on heavier soils where weed growth is heavy and where rainfall is expected to be relatively high. Use the higher rates also where longer residual control is desired in regions with a long growing season.

For best results, apply Pramitol 80WP prior to weed emergence or when weeds are young and actively growing.

For control of annual and susceptible perennial weeds (including downy brome grass, oat grass, goosegrass, quackgrass, puncture vine, goldenrod, and plantain): Broadcast 12 to 18 lbs. of Pramitol 80WP in 50-100 gals. of water per acre. For small areas, apply 4 to 6 lb. of Pramitol 80WP per 1,000 sq. ft. in sufficient water to give thorough and uniform coverage.

For control of hard-to-kill perennial weeds and grasses (including johnsongrass, bindweed, and wild carrot): Broadcast 50-74 lb. of Pramitol 80WP in 50-100 gals. of water per acre. For small areas, use 1 lb. 2 oz. to 1 lb. 11 oz. of Pramitol 80WP per 1,000 sq. ft. in sufficient water to give thorough and uniform coverage.

For faster top-kill of existing vegetation, apply Pramitol 80WP in diesel oil, fuel oil, or weed oil. Use 100-200 gals. of oil per acre. For dense vegetation including johnsongrass, which generally requires a minimum of 150 gals. of oil per acre for thorough coverage.

Under Asphalt Pavement

Pramitol 80WP may be used to extend the useful life of asphalt pavement by preventing weeds from emerging through it. Pramitol 80WP may be applied to the ground before laying asphalt.

Pramitol 80WP should be used only where the area to be treated has been prepared according to good construction practices. The site should be disked, plowed or otherwise prepared in accordance with good construction practices and recompact to allow good penetration of the Pramitol 80WP mixture.

Pramitol 80WP does not control woody vegetation such as small trees, brush and woody vines. Roots of such species should be grubbed and removed from the site prior to application. If rhizomes, tubers or other vegetative parts are present in the site they should be removed by scalping with a grader blade.

Pramitol 80WP may be applied to the ground before laying rapid medium or slow curing asphalt coatings such as those used in parking lots, highway shoulders and median strips, roadways and other industrial sites. Pramitol 80WP should be applied just prior to the laying of the asphalt coating to prevent possible lateral movement of the herbicide by rainfall or other mechanical means. Sprayers should be equipped to provide continuous agitation of the spray mixture during application to ensure application of a uniform spray emulsion.

Apply Pramitol 80WP uniformly at the rate of 50-62 lbs. per acre (0.16-0.20 oz. per sq. yd.) in a minimum of 100 gals. of water. Use the lower rate to control annual and susceptible perennial weeds including downy brome grass, oat grass, goosegrass, quackgrass, puncture vine, goldenrod and plantain. Use the higher rate to control hard-to-kill perennial weeds and grasses including johnsongrass, bindweed and wild carrot.

Precaution: Do not use Pramitol 80WP under asphalt coatings less than 3 inches thick.

Warning:

Keep out of reach of children.

Causes eye irritation. Avoid contact with eyes. Wash thoroughly after handling. Harmful if swallowed. Avoid contact with skin. Inhalation of dust and contamination of food and feed.

Do not contaminate water used for irrigation or domestic purposes.

Do not contaminate water by cleaning of equipment or disposal of wastes. Apply this product only as specified on this label.

Do not use for weed control in greenhouses.

Do not reuse container. Destroy when empty.

Pramitol trademark of CIBA-GEIGY for primetol.
U.S. Patent No. 2,909,420

Agricultural Division
CIBA-GEIGY Corporation
Greensboro, North Carolina 27409
CCA 44L2

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SELF-CHECK NO. 2



DIRECTIONS:

Use the resources listed in this module to answer the following questions regarding the pesticide label enclosed.

1. What is the brand name of this pesticide?
2. What is the common name of this pesticide?
3. What is the chemical name of this pesticide?
4. What is the type of formulation of this pesticide?
5. What is the signal word of this pesticide?
6. How many pounds of active ingredient are contained in one bag of this pesticide?
7. Is this pesticide supposed to be applied directly to plants as it comes in the container?
8. What does this pesticide control?
9. Is it recommended that this pesticide be used in the greenhouse?

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SELF-CHECK NO. 2

(continued)



10. What precautions does the applicator need to observe to avoid contamination?
11. Is this pesticide flammable?
12. Is this pesticide most effective through plant foliage or through plant roots?
13. Approximately how long is the residual activity of this pesticide?
14. Will this pesticide corrode metal surfaces?
15. Name two carriers (solvents) that can be mixed with this pesticide when applying it.
16. Describe 2 situations in which the use of this pesticide will be indicated.
17. Describe 2 situations in which the use of this pesticide will not be advisable.
18. What company manufactures this pesticide?
19. After reading this label what means of protection would you use when mixing and applying this pesticide?

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APPENDIX C

Sample Related Math Exercises
for Horticulture

ST. PETERSBURG VOCATIONAL TECHNICAL INSTITUTE

Related Math for Horticulture

Test on Liquid Measure

1. Change 44 quarts to gallons.
2. Change 7 1/2 gallons to quarts.
3. Change 7 pints to quarts.
4. What part of a gallon is 1 quart?
5. How many quarts of motor oil are in a drum containing 75 gallons of oil?
6. A water tank 10 feet long, 8 feet wide, and 6 feet high is a quarter full.
 - a. What is the volume of the tank?
 - b. How many gallons does a full tank contain?
 - c. How many gallons does it contain now?
7. A vat used to dip vegetables holds 225 gallons of fungicide. What is the approximate weight of the fungicide when the vat is full?
8. A liquid-fertilizer cylinder has a radius of 6 feet and a length of 16 feet. How many cubic feet of liquid does it hold?
9. How many gallons can a circular tank that is 14 feet deep and 10 feet in diameter hold?
10. A stream is 4 feet wide and has 24 inches of water flowing at the rate of 1 foot per second. Ignoring friction loss, how many cubic feet of water does the ditch deliver in
 - a. 1 second? _____
 - b. 1 minute? _____
 - c. 1 hour? _____
 - d. 1 day? _____

ST. PETERSBURG VOCATIONAL TECHNICAL INSTITUTE

Related Math for Horticulture

Posttest on Linear Measure

1. One mile is equal to (1,760 feet, 5,280 yards, 320 rods, all).
2. The meter is (shorter, equal to, longer than) the yard.
3. Match the following formulas:

a. $\pi \times d$ ____	1. perimeter of rectangle
b. $c \div \pi$ ____	2. perimeter of square
c. $4 \times s$ ____	3. circumference
d. $2(l + w)$ ____	4. diameter
e. $2 \times r \times \pi$ ____	5. radius
f. $d \div 2$ ____	
4. Change:
 - a. 15 yards to inches
 - b. 27 feet to yards
 - c. 4 1/2 yards to feet
 - d. 68 inches to feet (write remainder in inches)
 - e. 4 feet and 5 inches to inches
5. What part of a foot is 9 inches?
6. A square field measures 250 feet on one side. How many feet of wire are needed to enclose it on all sides?
7. A football practice field is 100 yards long and 120 feet wide. If a player runs around the field one time, how far has he run?
8. A circular exercise track for thoroughbred horses has a circumference of 1 1/4 miles. What is its diameter?
9. A circular flower bed is 5 feet in diameter. If flowers are to be planted 8 inches apart all the way around the edge of the bed, how many plants are needed?
10. A piece of land measuring an acre is approximately 175 feet by 247 feet. What is the distance around it?

SAMPLE

Calculating Parts Per Million

A relatively simple method can be used to calculate the amount of material needed to obtain a solution containing a specified ppm (parts per million). Multiply the percentage of active ingredient in the material by 75 to find the number of ppm that one ounce of the material will supply in 100 gallons of water.

Examples

1. How much ammonium nitrate is needed to prepare 100 gallons of a solution containing 200 ppm N?

Ammonium nitrate has 33% nitrogen, so multiply 33% N by 75, which is 24.8, or 25. Thus, 1 ounce of ammonium nitrate will supply 25 ppm of N in 100 gallons of solution. Since 200 ppm N are desired, divide 200 ppm by 25 ppm. The answer is 8--which means that 8 ounces of ammonium nitrate in 100 gallons of water will provide 200 ppm N.

2. How much sequestrene or iron chelate should be used to make 50 gallons of a solution containing 20 ppm iron?

Iron chelate has 12% iron, so multiply 12% by 75, which is 9. Thus, 1 ounce of iron chelate in 100 gallons of water will supply 9 ppm iron. Because 20 ppm iron are desired, divide 20 by 9, which is 2.2. This indicates that 2.2 ounces of iron chelate in 100 gallons of water will supply 20 ppm iron. Only 50 gallons of water are desired, so divide the amount by 2 (100 gallons divided by 50 gallons). The answer is that 1.1 ounces of iron chelate in 50 gallons of water will supply 20 ppm iron.

3. How much Dexon is needed to prepare 100 gallons of a solution providing 144 ppm active fungicidal ingredient?

The wettable powder of Dexon contains 35% active fungicide (Dexon 35% W.P.), so multiply 35% by 75, which is 26.25, or 26. Thus, 1 ounce of Dexon 35% will supply 26 ppm active fungicide in 100 gallons of water. Since 144 ppm are desired, divide 144 ppm by 26 ppm, which is 4. This indicates that 5.5 ounces of Dexon 35% in 100 gallons of water will supply 144 ppm of active fungicidal ingredient.

Calculating Parts Per Million

Problems

1. How much 20-20-20 is needed to prepare 5 gallons of solution containing 200 ppm N?
2. How much 5-10-10 is needed to prepare 2 gallons of a solution containing 150 ppm N?
3. How much Vendex miticide is needed to prepare 10 gallons of a solution containing 132 ppm active ingredient? Vendex is a 25% wettable powder.
4. How much manganese sulfate should be used to make 100 gallons of solution containing 30 ppm manganese? Manganese sulfate is 31% manganese.



State of Florida
Department of Education
Tallahassee, Florida
Betty Castor, Commissioner
Affirmative action/equal opportunity employer

Division of Vocational, Adult, and Community Education

DVACE/06/91/500

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CAREER MERIT ACHIEVEMENT PLAN (CAREER MAP)

ENVIRONMENTAL HORTICULTURE

(8121500)
(0101.069901CP)

STUDENT'S NAME



State of Florida

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DEPARTMENT OF EDUCATION

Betty Castor, Commissioner

DIVISION OF VOCATIONAL, ADULT, AND COMMUNITY EDUCATION

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FOR FURTHER INFORMATION, CONTACT

Bureau of Vocational Program and Staff Development
Division of Vocational, Adult, and Community Education
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**THIS MERIT ACHIEVEMENT PLAN RECORDS THE
ACHIEVEMENTS OF:**

Student's
Name _____

Student's ID
Number _____

Student's
Address _____

Instructor's
Name _____

Initials _____

School _____

Date
Started _____

**PRIMARY JOB TITLES FOR
THIS INSTRUCTIONAL PROGRAM**

- Disease and Insect Control Field Inspector (DOT #408.687-010)
- Horticultural Pest Control Worker (DOT #408.381-010)
- Horticultural Specialty Grower, field (DOT #405.161-014)
- Horticultural Specialty Grower, inside (DOT #405.161-018)
- Landscape Gardener (DOT #408.161-010)
- Landscape Laborer (DOT #408.687-014)
- Nursery Worker (OES #79005503)

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OVERVIEW

This Career MAP includes the competencies required for entry into the work force as an environmental horticulture worker. Business and industry representatives have recommended that students in this field master these competencies in order to become employable. Local education agencies (LEAs) may adapt these competencies to meet their work-force needs.

Purposes of the MAP

The purposes of the MAP are to display the student performance standards (SPSs) required by the LEA and to document the level of achievement on SPSs that the student demonstrates.

How to Use the MAP

Administrator and Instructor. The administrator and instructor can use Career MAPs in curriculum planning, program updating and improvement, and teacher recruitment, selection, and updating. If the LEA changes or adds SPSs, the revised or additional SPSs should be included in the blank boxes that appear within each intended outcome or at the end of this MAP.

Instructor. The instructor can use Career MAPs to keep track of student progress on SPSs. By periodically reviewing the ratings on standards, the instructor can identify a student's strengths and weaknesses and on that basis identify the skills for which the student needs remedial instruction or advanced training. MAPs can also be useful in student counseling and evaluation.

Co-op Instructor/Employer. The employer who sponsors a co-op program should use the Career MAP for keeping a record of the student's performance on appropriate standards. The MAPs will also help the co-op instructor/employer in counseling and evaluating the student.

Student. The student may use the MAP to show potential employers the performance standards he or she has mastered. In order to present a complete record, the student should encourage the co-op instructor/employer to rate his or her level of achievement on all the appropriate SPSs and to fill in the verification form in the back of this MAP.

Employer. The MAP shows an employer the SPSs mastered by the student (a prospective employee) and the proficiency level achieved on each one. This information can help the employer make decisions about hiring, job assignments, and job-training needs.

Rating Student Performance

Performance Competencies. Ratings on SPSs should be based upon business/industrial performance standards. The evaluator observes and evaluates student performance as he or she would in the role of the employer or supervisor.

For each skill listed, the learner receives a rating of 1, 2, or 3. Each rating indicates a particular level of achievement:

- 1 = Learner demonstrates knowledge and understanding of this SPS, but is not yet able to apply that knowledge or understanding.
- 2 = Learner performs this SPS satisfactorily with only periodic supervision.
- 3 = Learner performs this SPS satisfactorily without supervision.

Whenever a performance standard is demonstrated, the instructor checks the appropriate rating box (1, 2, or 3) and initials and dates the verification line. If the student later demonstrates a higher level of achievement on a performance competency, the instructor checks the higher level and then enters his or her initials and the new date on the verification line, as shown in the following example:

04 03	
Demonstrate the ability	1 ☐
to use an equipment manual	2 ☒
	3 ☒
MP (9/14/90) MP 11/13/90	K ☐
Verification	

Knowledge Competencies. For each SPS that is a knowledge competency only, with no manipulative skill involved, only one level of achievement is possible. If the student masters the competency, he or she receives a check in the bottom box ("K"), as shown below:

02 11	
Describe the causes and effects of air, water, and land pollution, and identify ways to prevent pollution.	1 ☐
	2 ☐
	3 ☐
MP 9/2/90	K ☒
Verification	

NOTE: An SPS without a checked rating indicates that the learner has not mastered the standard from lack of ability, time, opportunity, or need (the student's area of specialization may not have required it).

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF AGRICULTURE.

01 01
Prepare an overview of the history of agriculture

1 ☐
2 ☐
3 ☐
K ☐

Verification

01 02
Discuss agricultural products and services important to the local, state, national, and global economy

1 ☐
2 ☐
3 ☐
K ☐

Verification

01 03
Investigate career opportunities in agriscience, and identify which school activities would help one prepare for those careers

1 ☐
2 ☐
3 ☐
K ☐

Verification

01 04
Discuss agriculture's role in the interaction of population, food, and energy

1 ☐
2 ☐
3 ☐
K ☐

Verification

1 ☐
2 ☐
3 ☐
K ☐

Verification

1 ☐
2 ☐
3 ☐
K ☐

Verification

1 ☐
2 ☐
3 ☐
K ☐

Verification

1 ☐
2 ☐
3 ☐
K ☐

Verification

1 ☐
2 ☐
3 ☐
K ☐

Verification

02.0 APPLY IMPORTANT SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO AGRIBUSINESS AND NATURAL RESOURCES.

02 01
Discuss the importance of scientific classification in agriculture

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 02
Use scientific methods to solve problems in agriculture

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 03
Demonstrate the use of genetics, including probability applications, through an agricultural project/activity

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 04
Analyze how recent technology is impacting agriscience

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 05
Identify the components of an agricultural ecosystem, and recognize the role of each

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 06
Construct and analyze a diagram of a biological food chain common to Florida agriculture and natural resources

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 07
Describe how water, carbon, nitrogen, oxygen, sulfur, and phosphorus are recycled naturally

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 08
Evaluate soil profiles, land capability classes, and soil conservation practices

1 ☐
2 ☐
3 ☐
K ☐

Verification

02 09
List the components of Florida's freshwater systems (lakes, ground water, aquifer, sinkholes, rivers, and swamps), and explain the importance of managing these resources

1 ☐
2 ☐
3 ☐
K ☐

Verification

ENVIRONMENTAL
HORTICULTURE

02 10
Explain how increasing or decreasing the use of one natural resource may affect another resource

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

02 11
Describe the causes and effects of air, water, and land pollution, and identify ways to prevent pollution

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

02 12
Explain the flow of energy from the sun, through agricultural systems (i.e., the common food pyramid), and back into the abiotic environment

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

02 13
Recognize the environmental requirements necessary for a productive natural or man-made aquaculture system

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

02 14
Apply principles of sound waste management to environmental problems common to agricultural systems

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

03.0 PRACTICE AGRICULTURAL SAFETY.

03 01
List the most common causes of agricultural accidents

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

03 02
Discuss the importance of following proper safety precautions

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

03 03
Demonstrate safety procedures in the classroom and laboratory

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

03 04
Describe the importance of following the directions on chemical containers and in equipment operator manuals

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

03 05
Recognize the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR)

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

03 06
Demonstrate safe and effective use of laboratory equipment, instruments, and materials

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
3 ☐
K ☐

Verification _____

1 ☐
2 ☐
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04.0 DEMONSTRATE THE USE OF TOOLS AND EQUIPMENT, AND DESCRIBE THE PRINCIPLES OF AGRICULTURAL MECHANICS.

04.01
Describe the importance of using the proper tools and equipment for the job.

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Verification

04.02
Describe the principles of selected mechanical applications (e.g., levers, pulleys, hydraulics, internal combustion).

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Verification

04.03
Demonstrate the ability to use an equipment manual.

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04.04
Demonstrate the use of selected tools and equipment.

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04.05
Service, maintain, and store tools, equipment, and supplies.

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05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT FOR INSECTS, DISEASES, AND WEEDS.

05.01
Identify major types of pests and weed infestations.

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05.02
Identify and select an appropriate control for each major type of pest, including the use of Integrated Pest Management.

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Verification

05.03
Describe symptoms of pesticide poisoning.

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Verification

05.04
Extract pertinent information from a pesticide label.

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Verification

05.05
Select, mix, and apply a nonrestricted chemical, according to the label and local, state, federal, and EPA regulations.

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Verification

05.06
Clean and store pesticide application equipment, safety clothing, and safety equipment.

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Verification

05.07
Identify the proper disposal of containers and residual pesticides.

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Verification

05.08
Calibrate spray equipment, solve time, distance, area, volume, ratio, proportion, and percentage problems in agriscience.

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Verification

ENVIRONMENTAL
HORTICULTURE

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Verification	Verification	Verification

06.0 DESCRIBE THE PRINCIPLES OF PLANT GROWTH AND REPRODUCTION.

06 01 Identify the raw materials and products of photosynthesis and respiration, the plant structures involved, and the environmental conditions necessary for each reaction. 1 ☐ 2 ☐ 3 ☐ K ☐	06 02 Describe the functions of roots, stems, leaves, and flowers. 1 ☐ 2 ☐ 3 ☐ K ☐	06 03 Demonstrate sexual and asexual plant propagation. 1 ☐ 2 ☐ 3 ☐ K ☐
Verification	Verification	Verification
06 04 Demonstrate the effects of nitrogen (N), phosphorus (P), and potassium (K) on plant growth. 1 ☐ 2 ☐ 3 ☐ K ☐	06 05 Extract pertinent information from a fertilizer label. 1 ☐ 2 ☐ 3 ☐ K ☐	06 06 Describe the short- and long-range impact of fertilizer on people and the environment. 1 ☐ 2 ☐ 3 ☐ K ☐
Verification	Verification	Verification
1 ☐ 2 ☐ 3 ☐ K ☐	1 ☐ 2 ☐ 3 ☐ K ☐	1 ☐ 2 ☐ 3 ☐ K ☐
Verification	Verification	Verification

07.0 APPLY MANAGEMENT SKILLS AND ECONOMIC PRINCIPLES TO AGRIBUSINESS AND NATURAL RESOURCES.

07 01 Identify basic economic principles applicable to agribusiness. 1 ☐ 2 ☐ 3 ☐ K ☐	07 02 Explain the importance of local, state, and federal regulations and required documentation affecting agriculture. 1 ☐ 2 ☐ 3 ☐ K ☐	07 03 Describe the types of agribusiness by organizational structure. 1 ☐ 2 ☐ 3 ☐ K ☐
Verification	Verification	Verification
07 04 Select and use computer applications appropriate to agribusiness. 1 ☐ 2 ☐ 3 ☐ K ☐	07 05 Form one or more inferences or hypotheses from records summarized in tables, graphs or pictures. 1 ☐ 2 ☐ 3 ☐ K ☐	07 06 Keep and maintain supervised agricultural experience (SAE) records. 1 ☐ 2 ☐ 3 ☐ K ☐
Verification	Verification	Verification

07 07
Interpret legal descriptions of
land in Florida

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Verification

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Verification

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Verification

08.0 EXPLAIN THE BASIC FUNCTIONS OF THE MARKETING PROCESS IN AGRICULTURE.

08 01
Describe key factors in
marketing agricultural products

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2 ☐
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K ☐

Verification

08 02
Select agricultural products
according to grades and
standards

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2 ☐
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K ☐

Verification

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Verification

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Verification

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS.

09 01
Demonstrate acceptable work
habits and attitudes

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Verification

09 02
Follow oral and written
directions with understanding,
form questions that clarify
directions as needed

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3 ☐
K ☐

Verification

09 03
Communicate effectively in
oral, written, visual, and
nonverbal modes; demonstrate
effective telephone skills

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K ☐

Verification

09 04
Recognize and demonstrate
reflective listening skills and
assertive communications skills
in the workplace

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K ☐

Verification

09 05
Conduct small, informal group
meetings

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2 ☐
3 ☐
K ☐

Verification

09 06
Demonstrate a knowledge of
the opportunities for leadership
development available through
an appropriate student
organization

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2 ☐
3 ☐
K ☐

Verification

1 ☐ 2 ☐ 3 ☐ K ☐	1 ☐ 2 ☐ 3 ☐ K ☐	1 ☐ 2 ☐ 3 ☐ K ☐
Verification	Verification	Verification

10.0 DESCRIBE THE HORTICULTURE INDUSTRY.

10.01 Describe the importance of horticulture to the American and global economies 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	10.02 Identify career opportunities in horticulture and educational requirements and continuing education opportunities for horticulture careers 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	10.03 Describe the importance of horticulture to the environment 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
10.04 Describe regulations that affect the horticulture industry 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	10.05 Identify professional organizations and trade journals in the horticulture industry 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

11.0 IDENTIFY AND CLASSIFY PLANTS.

11.01 Identify plants by scientific and common names Levels I and II 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	11.02 Classify plants botanically, and list environmental preferences of plants (e.g. shade, sun, wind, moisture, salt) Levels I and II 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

12.0 PROPAGATE PLANTS.

12.01
Identify propagating and
growing facilities and
structures

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K

Verification

12.02
Prepare propagation media

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Verification

12.03
Select and collect propagation
materials

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K

Verification

12.04
Demonstrate propagation by
sexual and asexual methods

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2
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Verification

12.05
Demonstrate environmental
controls for propagation
materials (e.g. moisture,
temperature, light)

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2
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K

Verification

12.06
Transplant rooted propagation
materials

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Verification

1
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Verification

1
2
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Verification

1
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K

Verification

13.0 IDENTIFY GROWING MEDIA AND APPLY FERTILIZERS.

13.01
Identify soil and media
materials

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K

Verification

13.02
Identify nutritional needs of
plants

1
2
3
K

Verification

13.03
Collect soil samples for
laboratory analysis and
interpret the results

1
2
3
K

Verification

13.04
Identify symptoms of nutritional
deficiencies and toxicities of
plants

1
2
3
K

Verification

13.05
Identify types and kinds of
fertilizers

1
2
3
K

Verification

13.06
Identify methods of distributing
fertilizers

1
2
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K

Verification

13.07
Interpret a fertilizer analysis
from information on tag or
container

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2
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K

Verification

13.08
Develop a fertilization schedule

1
2
3
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Verification

13.09
Determine rate of fertilizer
application

1
2
3
K

Verification

13 10
Apply fertilizer and soil
amendments

1 ☐
2 ☐
3 ☐
K ☐

Verification

13 11
Apply special fertilization
methods appropriate to a
region or plant group

1 ☐
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Verification

13 12
Maintain fertilization records

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Verification

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Verification

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Verification

14.0 IRRIGATE PLANTS AND TURF.

14 01
Identify water needs of plants

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3 ☐
K ☐

Verification

14 02
Identify sources and quality of
water for irrigation

1 ☐
2 ☐
3 ☐
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Verification

14 03
Identify irrigation components
and types of systems

1 ☐
2 ☐
3 ☐
K ☐

Verification

14 04
Install irrigation system
components

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3 ☐
K ☐

Verification

14 05
Irrigate plants at recommended
rates

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2 ☐
3 ☐
K ☐

Verification

14 06
Identify procedures for
measuring water-application
rates

1 ☐
2 ☐
3 ☐
K ☐

Verification

14 07
Repair irrigation systems

1 ☐
2 ☐
3 ☐
K ☐

Verification

14 08
Identify drainage components
for different types of drainage
systems

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2 ☐
3 ☐
K ☐

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Verification

15.0 CONTROL PESTS.

15.01
Identify common pests of
plants (e.g. diseases, weeds,
nematodes)

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Verification

15.02
Describe life cycles of common
pests of plants

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K ☐

Verification

15.03
Classify insects according to
feeding habits

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2 ☐
3 ☐
K ☐

Verification

15.04
Describe biological, chemical
and cultural methods of
controlling plant pests

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2 ☐
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Verification

15.05
Select and identify pesticides
according to controlling action
(e.g. stomach, contact,
systemic)

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2 ☐
3 ☐
K ☐

Verification

15.06
Interpret information on a
pesticide or agricultural
chemical label

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K ☐

Verification

15.07
Describe symptoms of
pesticide poisoning, and
identify required first aid

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3 ☐
K ☐

Verification

15.08
Comply with local, state,
federal, and Environmental
Protection Agency (EPA)
regulations regarding
pesticides

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2 ☐
3 ☐
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Verification

15.09
Store, select, mix, and apply
pesticides safely according to
the product label

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2 ☐
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K ☐

Verification

15.10
Clean, adjust, and calibrate
spray equipment

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Verification

15.11
Maintain pesticide records

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16.0 CONTROL PLANT GROWTH.

16.01
Identify methods of pruning
plants to achieve desired
growth and to maintain health

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Verification

16.02
Identify and select chemical
growth regulators

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Verification

16.03
Identify appropriate time to
prune plants

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Verification

ENVIRONMENTAL
HORTICULTURE

16.04	Identify and select pruning tools for the task.	1 ☐
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Verification		

16.05	Prune plants safely and sterilize tools.	1 ☐
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Verification		

16.06	Root-prune appropriate plants.	1 ☐
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Verification		

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Verification		

17.0 HARVEST, TRANSPORT, AND INSTALL PLANT MATERIALS.

17.01	Determine requirements for preserving plant viability.	1 ☐
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Verification		

17.02	Install containerized plant materials.	1 ☐
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Verification		

17.03	Select and prepare plants for transportation and transplanting.	1 ☐
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Verification		

17.04	Describe principles of xeriscaping.	1 ☐
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Verification		

17.05	Describe principles of integrated landscape management.	1 ☐
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18.0 OPERATE, REPAIR, AND MAINTAIN TOOLS AND EQUIPMENT.

18.01	Perform equipment preoperational check.	1 ☐
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Verification		

18.02	Identify, maintain, and safely operate hand tools and power tools.	1 ☐
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Verification		

18.03	Identify, maintain, and safely operate small gasoline engines.	1 ☐
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Verification		

18.04	Identify, maintain, and safely operate power equipment	1 ☐
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Verification		

18.05	Maintain equipment-operation and service records	1 ☐
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19.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATIONS, AND HUMAN-RELATIONS SKILLS.

19.01	Conduct group meetings, using parliamentary procedure and public speaking skills	1 ☐
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		3 ☐
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Verification		

19.02	Identify acceptable work habits and personal characteristics	1 ☐
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		3 ☐
		K ☐
Verification		

19.03	Identify acceptable employee hygiene habits	1 ☐
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		3 ☐
		K ☐
Verification		

19.04	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons	1 ☐
		2 ☐
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Verification		

19.05	Demonstrate knowledge of how to make job changes	1 ☐
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Verification		

19.06	Identify documents that may be required for a job application	1 ☐
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Verification		

19.07	Complete pertinent forms for employment (e.g. resume, job application, W-4)	1 ☐
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		3 ☐
		K ☐
Verification		

19.08	Demonstrate competence in job interview techniques	1 ☐
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Verification		

ENVIRONMENTAL
HORTICULTURE

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

VERIFICATION

Each instructor who rates this student on competencies in this MAP should fill in one of the boxes below.

Initials	Signature
	Title
	School Name
	School Address

Initials	Signature
	Title
	School Name
	School Address

Initials	Signature
	Title
	School Name
	School Address

COOPERATIVE WORK EXPERIENCE

In addition to classroom training and laboratory performance identified on the Career MAP, this student has participated in cooperative work experience with employers, as shown below.

Dates	Employer
	Employer's Address
	Supervisor
	Supervisor's Title

Dates	Employer
	Employer's Address
	Supervisor
	Supervisor's Title

Dates	Employer
	Employer's Address
	Supervisor
	Supervisor's Title

This section of the MAP is provided for the instructor, employer, or student to list additional qualifying statements or other pertinent information. All comments should be initialed for verification.

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, leaving small margins at the top and bottom. There is no handwriting or printed text on the page.

DVACE/06/91/3000

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